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ABSTRACT

This is one of four performance assessment resources booklets for Level III of the Intermediate Science Curriculum Study (ISCS). The four booklets are considered one of four major subdivisions of a set of individualized evaluation materials for Level III developed as a part of the ISCS Individualized Teacher Preparation (ITP) program. Each of these booklets, which accompanies a pair of the student texts, is a teacher's handbook to be used in identifying the appropriate performance checks with which to evaluate each student. Each also indicates how to set up testing situations, correct responses, and give remedial help. This manual covers Why You're You (WYY) and Investigating Variation (IV) in five units. Each unit begins with a summary table that includes the objectives and performance checks of the unit. Immediately following each table comes the bulk of resource material for each objective introduced in that unit. Suggested ways teachers can use the manual are also included. (HM)

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ED178293

INTERMEDIATE SCIENCE CURRICULUM STUDY

ISCS

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INDIVIDUALIZED TESTING SYSTEM

Performance Assessment Resources

ISCS LEVEL III
WYY-IV

SE 020 480

SILVER BURDETT
GENERAL LEARNING CORPORATION
Morristown, New Jersey · Park Ridge, Ill. · Palo Alto · Dallas · Atlanta

INDIVIDUALIZED TESTING SYSTEM

ALL LEVELS
Individualizing Objective Testing (an ITP module)
Evaluating and Reporting Progress (an ITP module)

LEVEL I
Performance Objectives, ISCS Level I
Performance Checks, ISCS Level I, Forms A, B, and C
Performance Assessment Resources, ISCS Level I, Parts 1 and 2

LEVEL II
Performance Objectives, ISCS Level II
Performance Checks, ISCS Level II, Forms A, B, and C
Performance Assessment Resources, ISCS Level II, Parts 1 and 2

LEVEL III
Performance Objectives, ISCS Level III
Performance Checks, ISCS Level III, ES-WB, Forms A, B, and C
WYY-IV, Forms A, B, and C
IO-WU, Forms A, B, and C
WW-CP, Forms A, B, and C
Performance Assessment Resources, ISCS Level III, ES-WB
WYY-IV
IO-WU
WW-CP

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FOREWORD

To implement an educational approach successfully, one must match the philosophy of evaluation with that of instruction. This is particularly true when individualization is the key element in the educational approach. Yet, as important as it is to achieve this match, the task is by no means simple for the teacher. In fact, without specific resource materials to help him, he is apt to find the task overwhelming. For this reason, ISCS has developed a set of individualized evaluation materials as part of its Individualized Teacher Preparation (ITP) program. These materials are designed to assist teachers in their transition to individualized instruction and to help them tailor their assessment of students' progress to the needs of all their students.

The two modules concerned with evaluation, *Individualizing Objective Testing* and *Evaluating and Reporting Progress*, can be used by small groups of teachers in in-service settings or by individual teachers in a local school environment. Hopefully, they will do more than give each teacher an overview of individualized evaluation. These ITP modules suggest key strategies for achieving both subjective and objective evaluation of each student's progress. And to make it easier for teachers to put such strategies into practice, ISCS has produced the associated booklets entitled *Performance Objectives, Performance Assessment Resources,* and *Performance Checks.* Using these materials, the teacher can objectively assess the student's mastery of the processes, skills, and subject matter of the ISCS program. And the teacher can obtain, at the moment when they are needed, specific suggestions for remedying the student's identified deficiencies.

If you are an ISCS teacher, selective use of these materials will guide you in developing an individualized evaluation program best suited to your own settings and thus further enhance the individualized character of your ISCS program.

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THE ISCS INDIVIDUALIZED TESTING SYSTEM

The ISCS individualized testing system for each level of ISCS is composed of four major subdivisions:

1. The ITP modules *Evaluating and Reporting Progress* and *Individualizing Objective Testing*,
2. *Performance Objectives*,
3. *Performance Checks* in three alternate forms, and
4. *Performance Assessment Resources*.

Evaluating and Reporting Progress presents a comprehensive overview, with many refinements, for individualizing the grading and reporting of students' progress, based on both subjective and objective criteria. The module *Individualizing Objective Testing* describes more specifically those ISCS evaluation materials which have objective criteria – the performance objectives, checks, and resources – and it presents practical suggestions for their use. These two modules should be considered prerequisite to successful use of the other ISCS evaluation materials.

Each of the *Performance Objectives* booklets contains a composite list of selected measurable objectives considered important to a given level of the ISCS program. However, many of the long-range goals and aims that are at the heart of the ISCS program do not lend themselves to being expressed as measurable performance objectives. Thus, these booklets should not be construed as being all-inclusive anthologies of all the possible learning outcomes of ISCS.

Each of three *Performance Checks* booklets contains an equivalent but alternative set of performance checks which were developed to assess the students' achievement of the objectives stated in the *Performance Objectives* booklets.

The *Performance Assessment Resources* booklet is a teacher's handbook to be used in identifying the appropriate performance checks with which to evaluate each student. The booklet also indicates how to set up testing situations, correct responses, and give remedial help.

NOTES TO THE TEACHER

An overview of evaluation, including both objective and subjective criteria, is given in the module *Evaluating and Reporting Progress* and many aspects of this booklet are described in more detail in Chapter 3 of the module *Individualizing Objective Testing*. These notes are meant to augment, not replace, Chapter 3 of that module. As you use this booklet, you will begin to see ways to modify its suggestions to meet your needs better. You are encouraged to enter your modifications at the points at which they apply. Only by altering these materials will you evolve an evaluation system best suited to your own classroom environment. It is important to remember that only principles involved in objective criterion-referenced evaluation are applied in this booklet. Therefore, you will obviously want to incorporate subjective criteria also.

Texts, Units, and Chapters

There are four *Performance Assessment Resources* booklets for Level III of ISCS. Each of these booklets accompanies a pair of the student texts. The pairs of texts and their abbreviated symbols are as follows:

Environmental Science - Well-Being (ES-WB)
Why You're You - Investigating Variation (WYY-IV)
In Orbit - What's Up (IO-WU)
Winds and Weather - Crusty Problems (WW-CP)

The testing materials for each text are divided into units, thus breaking up each Level III text into easily handled sections of correlative chapters and related excursions. The relationships between the units and the chapters of *Why You're You* and *Investigating Variation* are shown in Table 1.

TEXT	UNIT	CHAPTERS
WYY	1	1 thru 3
WYY	2	4 and 5
WYY	3	6 and 7
IV	1	1 and 2
IV	2	3 thru 5

Table 1

Most units include the objectives and performance checks for two chapters and their related excursions. You will recall that the number before the hyphen in the identification number for an excursion states the chapter to which it is related. The individual objectives and performance checks for each unit are to be selected and used when the student has completed the designated chapters and any excursions he wishes to do. This delay should ensure that there is no premature assessment of the student's achievement of concepts and skills which may be introduced early in a unit,

but which require development throughout the unit. Thus, subdividing units for assessment purposes should be done with great care. Keep this in mind if you decide to spot check students as they proceed through units, rather than conducting a formal evaluation at the end of the unit.

Summary Table

Each unit begins with a double-spread "Performance Check Summary Table." The left-hand page of the "Summary Table" serves as a table of contents for the unit. It provides a great deal of information about the objectives pertinent to the unit. Usually about twenty-five objectives for each unit are introduced for the first time in each "Summary Table." A maximum of ten relevant objectives from previous units are reintroduced.

On the left-hand side of the "Summary Table" is a list of code numbers, each of which is unique to one objective within the level. Two examples of code numbers and their meaning are illustrated in Figure 1 below.

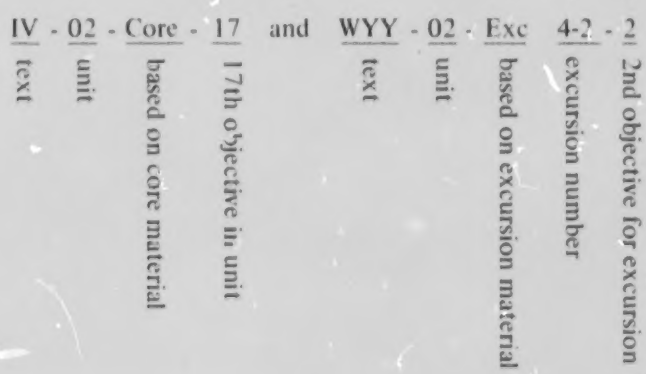


Figure 1

The core objectives appear first in an order that corresponds roughly to the text development. Exceptions to this ordering were made to place objectives based on related processes or content together. Objectives based on remedial excursions are numbered as core objectives because they involve skills essential to success in core activities. Next are listed the general or enrichment excursion objectives, and these are followed by objectives from prior units which are again considered important to the students' progress. These repeated objectives are easily spotted, as a capital R (for Repeated) appears after their identifying code number, giving a listing such as WYY-02-Core-17R. The specific resource aids to be used with repeated objectives are given in the units designated by the code number (unit 2 in the just-cited example), and the information is not repeated each time within the textual material that follows the "Summary Table."

Each objective code number is followed by a short descriptive statement of that objective. These short statements were written, using the students' vocabulary. They should be helpful in communicating the objectives to the students should you desire to do so. Ways to involve your students in selecting the objectives are discussed in the module *Individualizing Objective Testing*.

The right side of the "Summary Table" is made up of eleven columns. Letters are used in the first five to designate the characteristics of the performance check. The letters and their meanings are as follows:

M - Completing the check requires regular ISCS materials.
O - An observer should view the student's performance as he does the check.
P - Completing the check requires the use of specially prepared materials.
Q - The answer to the check is of the quick-scoring variety.
T - The check will require more than three minutes of the student's time.

Check marks in the next four columns help the teacher assign appropriate performance checks to individual students. The first of these columns is entitled "Basal." Achieving the objectives checked in this column is considered essential to the student's progress. These performance checks may be assigned to any student; however, better students will find that many of these offer little or no challenge.

Check marks in the columns headed "Math," "Reading," and "Concept" indicate performance checks which require a higher level of computational skills, a higher reading level, or a greater ability to think abstractly than the performance checks for most other objectives. Performance checks which have no marks in any of these four columns are considered to be more than basal, but the skills which they require are within the capabilities of most students.

A tenth column lists the action verb that identifies the theoretical mental process required of the student to complete the performance check for the objective. A precise definition of each of the verbs used to designate mental processes is given in the module *Individualizing Objective Testing*.

Finally, in the eleventh column, space is provided for notes. Although you will find an occasional comment printed here, this space is mainly for your notes. It's a good place to put any special instructions or preparations you have found helpful.

As mentioned earlier, some objectives are repeated objectives – ones that have appeared in previous units. When such an objective is listed again in the "Summary Table," its classification as basal or as presenting math, reading, or conceptual difficulties is likely to be different. This change most often derives from a change in purpose. The first time a concept or skill is introduced, the intent may be only to introduce students to it. When reintroduced in a later unit, the skill or concept is frequently developed and used extensively. Thus, in the "Summary Table" for the earlier unit, objectives related to a concept are likely to be classified as conceptually difficult for many students, whereas in the later units, the same objective might be reclassified as basal.

Organization of Resources

Immediately following each "Summary Table" comes the bulk of the resource material for each objective introduced in that unit. Once more, each objective is identified by its code number, but this time it appears in bold, black print in the outer margin directly beside the applicable resource. A pair of horizontal lines separates the resources for each objective from those for the previous and following objectives. When no horizontal line appears at the bottom of a page, the resource material for the objective is continued on the next page.

The functions of the various component resources provided for the objectives are listed below. Two of the components (Regular Supplies and Special Preparations) appear only when they are needed for a particular check. When the performance check does not require any supplies, the supply headings are omitted. Observe the functional descriptions carefully – they are the keys to the types of resource materials provided in the *Performance Assessment Resources* booklet.

COMPONENTS	FUNCTION
Descriptive Statement	This statement duplicates the one that appears in the "Summary Table." If you misread a code number and find yourself looking at material for the wrong objective, this should stop you and send you back to the Table to check. More important, it should briefly indicate to you the basic purpose of the objective.
Objective	The underlined verb in this statement of the objective indicates the theoretical mental process that the student will perform. The phrase following it indicates the content or process skill which the student must perform. A complete description of the verbs and their meanings can be found in the ITP module *Individualizing Objective Testing*.
Regular Supplies	This section lists any ISCS equipment that the student will need – regular equipment that is being used in the unit on which the student is being evaluated or in previous units.
Special Preparations	Don't overlook this section. It lists and describes materials the teacher must collect or prepare in some way. Included are special solutions, special packaging, and labels required for materials for evaluation purposes. The section also specifies particular grids, charts, or maps that the student will need to complete the check.

Student Action	This is a general description of what the student should do in responding to any of the three performance checks based on the objective. If his expected response is to state a general principle, it is listed in this section. If the three performance checks require specific answers, they are provided below the general statement in the student action.
Performance Check A	Performance Check A is fully stated to allow for a quick review of the statement of the tasks as they are presented to the student. Performance Checks B and C generally present slightly different situations or wording but ask students to perform equivalent tasks.
Remediation	This final section outlines suggested action that can be taken if the student fails to achieve the objective. In some of the remediations, the listed steps are sequential; in others the steps represent options from which it is suggested that you select one or two. Some remediations suggest referring the student to review sections of the core, doing an excursion, or reviewing a self-evaluation question and its response.

How To Find It

Locating a particular objective whose number you know is easy. Just thumb through the pages watching for the unit number which appears in large black print above the word *core* or *excursion* in the margins. But suppose you wish to locate an objective pertinent to a given section or chapter of the text and you don't know the number. Here is a procedure to follow:

1. Determine the unit in which the chapter occurs, using Table 1.
2. Thumb through this booklet until you find that unit number as the beginning digits of any code number appearing in large black print in the outer margin.
3. Look for the "Summary Table" at the beginning of that unit.
4. Use the "Summary Table" to determine the number of the objective you seek.

Be Selective

The resource books for each level contain many more objectives and resources than any one teacher can use. If you add objectives and resources, and you probably will, your list will expand further. The most successful user of this catalog will be the teacher who picks and chooses selectively to meet the specific needs of his students. Therefore, once you are familiar with this book, it is imperative that you establish a system of selecting and assigning checks to the student. Suggestions on how to establish this are given in Chapter 3 of *Individualizing Objective Testing*.

Whatever selection and assignment system you develop, it must give due regard to the individual student's differences. For example, if you administer too many recall

performance checks to a high-ability student, he will not only be bored but you will also fail to assess his progress adequately. Too many difficult items administered to a low-ability student leads to frustration and reinforcement of the "I knew I couldn't do it" attitude. On the other hand, even the best students need their egos inflated by some questions that they can answer easily. And, the less able student needs to be appropriately challenged. Be careful, too, of placing too much emphasis on objectives. This may lead students to place undue emphasis on tests, thus slowing their progress to the extent that they lose interest in the story line.

Assigning Performance Checks

How many performance checks should be assigned to a student? This question has no fixed answer. The primary concern is that performance checks provide the needed feedback to both you and the student. If, in your judgment, evaluating a student on a particular unit is unnecessary, then don't do it. If you feel a student needs to be evaluated, then assign an appropriate selection of performance checks. *Individualizing Objective Testing* makes suggestions about how to do this. In no case should any student be assigned all the performance checks or even a random sampling of them. Such a practice would subject the student to tasks which would be either unduly difficult and time-consuming or perhaps too simple for him and therefore meaningless, time-wasting activities.

You may wish to specify the equivalent form (A, B, or C) of performance checks that the student should do when assigning the specific performance check numbers. There is, of course, no difference in their difficulty level. In any case, have the student record both the number and the letter of the specific performance check he does. These numbers and letters should appear on his answer sheet, as they will be needed to check his response. Since the numbers are unique within each ISCS level, there is no need to use a student's time copying the performance checks. Listing the number with the response is sufficient. It's a good idea to remind students frequently that their answers must go on separate paper – not in the *Performance Checks* books.

As you assign checks, keep the supply situation in mind. You won't want too much of some equipment tied up in Special Preparations at any one time. To avoid this, keep abreast of the range of your students' progress and prepare only those materials you anticipate needing, referring to the P's appearing in the third column on the right-hand page of the "Summary Table." Batteries, of course, will need replacement or recharging occasionally, and specially boxed supplies should be checked periodically for missing or nonfunctioning parts.

At the back of the *Performance Assessment Resources*, you will find grids, charts, and maps identical to those the students must use in certain performance checks. The grids, charts, and maps at the back are suitable for reproduction. You may make copies directly, using one of the well-known commercial copiers. For large quantities at low cost, make a master by the thermo process and use it to make duplicates. If you make copies in either of these ways, your students will not be wasting time drawing grids, charts, and maps, and you will feel free to assign objectives that need these.

Why You're You **WYY**

WYY 01

Chapters 1 thru 3

Excursions 1-1 thru 2-1

Performance Check

Summary Table

Objective Number	Objective Description
WYY-01-Core-1	States the source and the function of sperm
WYY-01-Core-2	States the source and function of eggs
WYY-01-Core-3	Describes what happens to sperm during the mating of animals
WYY-01-Core-4	Etherizes fruit flies
WYY-01-Core-5	Separates dead flies from etherized fruit flies
WYY-01-Core-6	Separates male from female fruit flies
WYY-01-Core-7	States the procedure for obtaining virgin female fruit flies
WYY-01-Core-8	States an operational definition of *pure strain*
WYY-01-Core-9	States the stages in the life cycle of a fruit fly
WYY-01-Core-10	Recognizes examples of the four stages in a fruit fly life cycle
WYY-01-Core-11	Predicts the appearance of first-generation fruit fly offspring
WYY-01-Core-12	States the reason for studying the inheritance of one feature at a time
WYY-01-Core-13	Selects the appearance of first- and second-generation offspring
WYY-01-Core-14	Predicts the ratio of variations in second-generation offspring
WYY-01-Core-15	Establishes a ratio by sampling
WYY-01-Core-16	Judges whether appearance is a reliable indicator of pure strain
WYY-01-Core-17	Uses the operational definition of *pure strain*
WYY-01-Core-18	Selects the description of the first-generation offspring

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
						√				recalls	
						√				recalls	
						√				recalls	
	M		P		T					manipulates	
	M		P		T					classifies	
	M		P		T					classifies	
										recalls	
						√				recalls	
										recalls	
	M		P							identifies	
						√				applies	
										applies	
				Q		√				applies	
						√				applies	
	M	O	P		T					applies	
			P							applies	
						√				applies	
				Q		√				applies	

WYY 01

Objective Number	Objective Description
WYY-01-Core-19	Selects the description of the second-generation offspring of different pure-strain organisms
WYY-01-Core-20	States the appearance of the parents and the first-generation offspring of a cross
WYY-01-Core-21	Cleans up the work area at the close of class
WYY-01-Core-22	Cooperates with lab partners
WYY-01-Core-23	Returns equipment promptly to storage areas
WYY-01-Core-24	Responds to text questions
WYY-01-Core-25	Shows care for laboratory materials
WYY-01-Exc 1-1-1	Defines the word *cross* as it is used in the study of inheritance
WYY-01-Exc 1-2-1	Recognizes an operational definition
WYY-01-Exc 1-2-2	States the two questions that an operational definition answers
WYY-01-Exc 1-3-1	States the reason for small numbers of insects during the winter
WYY-01-Exc 1-4-1	States the total number of bits for a feature in a prior generation of ancestors
WYY-01-Exc 1-4-2	Decides whether genetic features can be traced to ancestors
WYY-01-Exc 2-1-1	States the procedure for calculating a rough ratio
WYY-01-Exc 2-1-2	Converts rough ratios to rounded-off ratios

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				applies	
						√				applies	
		O				√				chooses	
		O				√				chooses	
		O				√				chooses	
		O				√				chooses	
		O				√				chooses	
						√				recalls	
				Q		√				applies	
						√				recalls	
										applies	
				Q			√			applies	
										applies	
						√				applies	
				Q		√				applies	

WYY 01 Core 1

States the source and the function of sperm.

The student recalls the source and the function of sperm.

Student Action: Responding, in effect, that sperm are produced by the male parts – the anther (stamen) or testes – of plants and animals, and they can fertilize the eggs of the female.

Performance Check A:

1. What parts of plants and animals produce sperm?
2. What does a sperm do?

Remediation: (1) Check the student's responses to the Checkup on page 2. (2) Have him reread Excursion 1-1, page 89, and redo this check.

WYY 01 Core 2

States the source and function of eggs.

The student recalls the source and function of eggs.

Student Action: Responding, in effect, that an egg is produced by the female parts (or by pistils and ovaries) and can combine with a sperm to become a new plant or animal.

Performance Check A: For many organisms, producing offspring involves eggs and sperm.

1. What is the source of an egg?
2. What is the function of the egg?

Remediation: (1) Check the student's responses to the Checkup on page 2. (2) Have him read Excursion 1-1 on page 89 and redo this check.

WYY 01 Core 3

Describes what happens to sperm during the mating of animals.

The student recalls that during the mating of animals the male deposits sperm into the body of the female.

Student Action: Responding, in effect, that during the mating of animals the male deposits sperm directly into the body of the female.

Performance Check A: State what happens to sperm during the mating of animals.

Remediation: (1) Refer the student to number 3 of the Checkup on page 2. (2) If the student didn't answer this item correctly, suggest that he review Excursion 1-1, page 90, where the term *mating* is defined.

WYY 01 Core 4

Etherizes fruit flies.

The student manipulates the fruit flies and the etherizing apparatus.

Regular Supplies: ether
etherizer

Special Preparations: Label several vials WYY-01-Core-4. Put several live fruit flies and a supply of food into each vial. Several vials are necessary to allow the flies to rest after being etherized.

Student Action: Etherizing the fruit flies so that none of the flies are moving around and none have been killed (wings spread).

Performance Check A: Get an etherizer, some ether, and vial WYY-01-Core-4 from the supply area. Etherize the fruit flies in the vial. Have your teacher check the etherized fruit flies.

Remediation: (1) Suggest that the student review Activities 1-3 through 1-7 on pages 4 and 5. (2) Observe him as he repeats the check.

WYY 01 Core 5

Separates dead flies from etherized fruit flies.

The student classifies fruit flies with folded wings as etherized and fruit flies with outstretched wings as dead.

Regular Supplies: 2 capped vials
ether
etherizer

Special Preparations: Label a few vials WYY-01-Core-5. Put several live fruit flies, several dead flies, and food into the vials. The extra vials allow the flies to rest.

Student Action: Separating the fruit flies into two groups – the etherized flies with folded wings and the dead flies with outstretched wings – and labeling the groups correctly.

Performance Check A: Get vial WYY-01-Core-5, two empty capped vials, an etherizer, and some ether from the supply area. Do not remove any flies from the vial yet. Etherize all the flies. Shake the vial gently. Remove the flies from the vial. Put the dead flies and the etherized flies into separate vials. Cap the vials, and label each as containing dead or etherized flies. Have your teacher check your work. Return all the flies to the vial you got them from.

Remediation: (1) Check the student's response to Self-Evaluation 1-3. (2) Refer him to the paragraph following Activity 1-7 on page 5 and to the accompanying diagrams which illustrate the difference between a dead fly and an etherized fly. (3) When the student has this distinction clearly in mind, have him redo the check.

WYY 01 Core 6

Separates male from female fruit flies.

The student classifies the fruit flies as males or females.

Regular Supplies: 2 vials with caps
ether
etherizer

Special Preparations: Put several live flies of both sexes into a few vials together with a small amount of food. Label the vials WYY-01-Core-6. Several vials are necessary to allow the flies to rest after being etherized.

Student Action: Separating the fruit flies into two groups – the males with blunt and black abdomens and the females with pointed and light-colored abdomens – and labeling the groups correctly.

Performance Check A: Get an etherizer, two empty vials with caps, some ether, and vial WYY-01-Core-6 from the supply area. Etherize the fruit flies. Separate the male flies from the female flies, and put them into separate vials. Cap the vials, and label each as containing male or female flies. Have your teacher check your work. Return all the flies to the original vial.

Remediation: (1) Check the student's response to question 1-3 and Table 1-1 on pages 6 and 7. (2) Have him review Table 1-1 and the illustrations of the male and female fruit flies on page 7. If necessary, discuss the differences between the male and female flies with him. (3) Have the student redo the check.

WYY 01 Core 7

States the procedure for obtaining virgin female fruit flies.

The student recalls the procedure for obtaining virgin female fruit flies from a vial containing all stages of fruit flies.

Student Action: Stating, in effect, the following steps:

1. clear the adults from the vial,
2. wait more than five and fewer than ten hours for more flies to hatch,
3. etherize the newly hatched flies, and
4. separate the virgin females from the males.

Performance Check A: State the steps you would follow to obtain virgin female fruit flies from a vial containing nonadult and adult fruit flies.

Remediation: (1) If the student doesn't know what a *virgin female fruit fly* is, refer him to the bottom paragraph on page 9. (2) For a review of the procedure for obtaining virgin females, refer him to page 10, especially Activity 1-8.

States an operational definition of *pure strain*.

WYY 01 Core 8

The student recalls the definition of *pure strain* for plants and animals.

Student Action: Responding to the effect that a pure strain is one in which all the offspring for several successive generations have the same characteristics.

Performance Check A: Give an operational definition of the term *pure strain*.

Remediation: (1) If the student doesn't know what *pure strain* means, suggest that he review page 8, where the term is defined. Also, refer him to Figure 1-3 which explicitly illustrates the term. If necessary, discuss Figure 1-3 with him. (2) If the problem is in defining operationally, have him do Excursion 1-2 on page 91. (3) if the Level III text *Investigating Variation* is available, refer him to pages 6 and 7 for a discussion of operational definitions.

States the stages in the life cycle of a fruit fly.

WYY 01 Core 9

The student recalls the stages in the life cycle of a fruit fly.

Student Action: Stating that the stages in the life cycle of a fruit fly are egg, larva, pupa, and adult.

Performance Check A: List the stages in the life cycle of a fruit fly.

Remediation: (1) Suggest that the student review Figure 1-6 on page 15 and also the verbal description of the life cycle on pages 15 and 16. (2) Emphasize the importance of his seeing these various stages in the development of his fruit flies by having him verbally describe or draw a picture of each stage.

Recognizes examples of the four stages in a fruit fly life cycle.

WYY 01 Core 10

The student identifies examples of each of the four stages in the fruit fly life cycle.

Regular Supplies: 1 hand lens

Special Preparations: Set up a stock culture of breeding flies and some food in a small capped jar labeled WYY-01-Core-10. All four stages in the life cycle should be present in the culture.

Student Action: Indicating that (1) the tiny white objects on top of the fly food are eggs, (2) the small wormlike creatures crawling through the food are larvae, (3) the light brown cases on the side of the jar are pupae, and (4) the free flying flies are adults.

Performance Check A: Get jar WYY-01-Core-10 and a hand lens from the supply area. Point out to your teacher the egg, the larva, the pupa, and the adult stages in the jar.

Remediation: See the related Remediation for WYY-01-Core-9.

WYY 01 Core 11

Predicts the appearance of first-generation fruit fly offspring.

The student applies the concept that one of two variations in a given feature will cover up (mask) the other in the first-generation offspring of a cross between two different pure-strain fruit flies.

Student Action: Stating that all of the first-generation offspring will show the same variation as one of the parents.

- **A:** They will all have either yellow bodies or black bodies.
- **B:** They will all have either bristles or no bristles on their bodies.
- **C:** They will all have either short wings or long wings.

Performance Check A: What appearance would be possible for first-generation offspring of a cross between fruit flies that are pure strain for yellow bodies and fruit flies that are pure strain for black bodies?

Remediation: (1) Refer the student to Activity 1-18. Review with him his results as reported in Tables 1-6 and 1-7. (2) Have the student review questions 2-2 and 2-3, the first-generation offspring of the corn cross in Figure 2-3, and the first-generation offspring of the cross of peas in bags 3 and 4, page 38. Then ask how many variations of a feature show up in the first-generation offspring of a cross of two different pure strains. (The fact that not all crosses mask is covered later.)

WYY 01 Core 12

States the reason for studying the inheritance of one feature at a time.

The student applies the concept that a systems approach permits an orderly investigation of factors in complex systems.

Student Action: Stating, in effect, that working with only one feature at a time makes it easier to follow feature variations systematically in experiments dealing with inheritance.

Performance Check A: John studied some flowering plants which have many different features that show variation. Why would John study the inheritance of only one feature, such as seed color, in one experiment although the plants inherit many features at one time?

Remediation: (1) Suggest that the student review page 26. (2) If necessary, discuss the concept with him. Ask him why it would be difficult to study all possible features at the same time.

WYY 01 Core 13

Selects the appearance of first- and second-generation offspring.

The student applies the concept that when two bean plants, each a pure strain for a different variation of a feature, are crossed, all the first-generation offspring show only one of the variations, but some of the second-generation offspring show one variation and some show the other.

Student Action: Predicting that the first-generation offspring will be all the same and the second-generation offspring will be a mixture.

A, B, and **C:** 1. a, 2. b

Performance Check A: Andy had two pure strains of beans. One strain had plain seeds, and the other strain had spotted seeds. He crossed the strains to get the first-generation offspring. Then he crossed the first-generation offspring to get the second-generation offspring. Select the answers below that agree with the results he would get.

1. The first-generation offspring seeds
   a. were all the same.
   b. were a mixture of plain seeds and spotted seeds.
2. The second-generation offspring seeds
   a. were all the same.
   b. were a mixture of plain seeds and spotted seeds.

Remediation: (1) If the student had difficulty with question 1, suggest that he review Activity 2-2 in which he examined the beans of the first-generation offspring. Ask him whether all the beans were the same color or whether there was a mixture of the two colors of the pure-strain parents. (2) If the student had difficulty with question 2, suggest that he review Activities 2-3 and 2-4 in which he examined beans from the second-generation offspring. If necessary, discuss this cross with him. (3) You may wish to refer the student to Self-Evaluation 2-1.

WYY 01 Core 14

Predicts the ratio of variations in second-generation offspring.

The student applies the rule for feature variation in the second-generation offspring of a cross between two pure strains.

Student Action: Predicting a 3-to-1 ratio.

Performance Check A: Joe crossed two pure-strain bean plants. One had spotted seeds, and the other had plain brown seeds. He crossed the first-generation offspring with each other. Predict the most likely ratio of variations of seed spots he will get in the second-generation offspring.

Remediation: (1) Suggest that the student review page 29 where the 3-to-1 ratio in the second-generation offspring is presented. Figure 2-2 may also be beneficial for review. (2) Check his response to questions 2-7, 2-8, and 2-9. (3) If he has difficulty understanding the concept of ratio, suggest that he do or review Excursion 2-1. (4) Review his responses to Self-Evaluations 2-2 and 2-3 with him.

WYY 01 Core 15

Establishes a ratio by sampling.

The student applies the concept of sampling.

Regular Supplies: 50-ml beaker
white beans
brown beans

Special Preparations: Put 200 beans, mixed brown and white, into a box labeled WYY-01-Core-15.

Student Action: Drawing a sample of 30 to 80 beans, counting the number of each type of object in the sample, and calculating the ratio of one type to the other in the sample. Arriving at an answer by any means other than sampling is unacceptable in this case.

Performance Check A: Tell your teacher that you are about to do this check.
In the supply area, you will find a box of beans labeled WYY-01-Core-15. Quickly and accurately, estimate the ratio of brown beans to white beans in the box.

Remediation: (1) Go over the student's calculations with him. (2) Check his answer to Self-Evaluation 2-2. (3) Check his entries in Table 2-1. Discuss his results with him if necessary. (4) If he does not understand the concept of ratio clearly, direct him to Excursion 2-1.

WYY 01 Core 16

Judges whether appearance is a reliable indicator of pure strain.

The student applies the concept that appearance is insufficient evidence on which to determine whether or not an organism is pure strain.

Special Preparations: Label three cappable vials A, B, and C, and place several beans in each. The beans in each vial must be identical. Store the vials in a box labeled WYY-01-Core-16.

Student Action: Stating that appearance is not enough evidence to tell whether or not an organism is pure strain.

Performance Check A: Get vial A from box WYY-01-Core-16 in the supply area. Examine the beans carefully. Are they pure-strain beans?

Remediation: (1) Check the student's responses to questions 3-1 through 3-12 on pages 34 through 36 and, if necessary, review Activities 3-1 and 3-2 with him to establish how one determines a pure strain. (2) If his answer to question 3-12, page 36, shows that defining *pure strain* is the problem, review page 8 of the text with him. (3) Have him review the acceptable response to Self-Evaluation 2-4.

WYY 01 Core 17

Uses the operational definition of *pure strain.*

The studen: applies the concept of a pure strain of organisms as defined by the ISCS two-bit model.

Student Action: Responding positively and to the effect that the organisms are pure strain if all the offspring have the same variation as the parents for two generations of offspring.

Performance Check A: The table below refers to the offspring produced by mating two pea plants, both of which had yellow seeds.

GENERATION	SEED COLOR
Parents	yellow
1st-generation offspring	yellow
2nd-generation offspring	yellow

1. According to the ISCS two-bit model, is this variety of pea pure strain for seed color?
2. Explain your answer.

Remediation: (1) If the student doesn't know what *pure strain* means, suggest that he review page 8, where the term is defined. Also, refer him to Figure 1-3 which explicitly illustrates the term. If necessary, discuss Figure 1-3 with him. (2) If the problem is in operationally defining, have the student do Excursion 1-2 on page 91. (3) If the Level III text *Investigating Variation* is available, refer the student to pages 6 and 7 for a discussion of operational definitions.

WYY 01 Core

Selects the description of the first-generation offspring.

The student applies the concept that the first-generation offspring of a cross between parents that are pure strain for different variations of the same feature all have the variation of the feature shown by one of the parents.

Student Action: Selecting that statement which describes all the offspring as showing the variation of the feature shown by one of the parents.

A: b
B: d
C: c

18

Performance Check A: Suppose you crossed a pea plant that was pure strain for white flowers with one that was pure strain for yellow flowers. Which statement best describes the flowers of the first-generation offspring of this cross?

a. Half the plants will have white flowers, and half will have yellow flowers.
b. Either all the plants will have white flowers, or all the plants will have yellow flowers.
c. There will be a 3-to-1 ratio of plants with yellow flowers to plants with white flowers.
d. There will be a 3-to-1 ratio of plants with white flowers to plants with yellow flowers.
e. All the plants will have yellow- and white-spotted flowers.

Remediation. (1) See the Remediation for WYY-01-Core-13. (2) Refer the student to Self-Evaluation 3-1.

WYY 01 Core 19

Selects the description of the second-generation offspring of different pure-strain organisms.

The student applies the concept that the second-generation offspring of a cross between two different pure strains will exhibit a 3-to-1 ratio of the variations of the original parents.

Student Action: Selecting the statement which describes the second-generation offspring as showing a 3-to-1 ratio of the variations.

A: d
B: b
C: c

Performance Check A: Suppose you were to cross snapdragons that were pure strain for yellow flowers with snapdragons that were pure strain for purple flowers. Select the statement below that best describes the appearance of the second-generation offspring of this cross.

a. Half of the plants will have all purple flowers, and the other half will have all yellow flowers.
b. All of the plants will have one-color flowers, but I cannot tell if they will be yellow or purple.
c. All of the plants will have half purple flowers and half yellow flowers.
d. Some plants will have all yellow flowers, and the others will have all purple flowers. There will be a 3-to-1 ratio of the colors.
e. All of the flowers will be part yellow and part purple.

Remediation: (1) See the Remediation for WYY-01-Core-14. (2) Refer the student to Self-Evaluations 3-1 and 3-2.

States the appearance of the parents and the first-generation offspring of a cross.

WYY 01 Core 20

The student applies the concept that one of the parents and all of the first-generation offspring of a cross between two different pure strains have the same variation of a feature as three-quarters of the second-generation offspring and the other parent has the same variation as the rest of the second-generation offspring.

Student Action: Stating that all of the first-generation offspring and one of the parents had the predominant characteristic of the second-generation offspring and the other parent had the other characteristic.

A: First-generation offspring had red flowers. One parent had red flowers, and one had yellow flowers.

B: First-generation offspring were tall plants. One parent was a tall plant, and one was a dwarf plant.

C: First-generation offspring produced red potatoes. One parent produced red potatoes, and one produced tan potatoes.

Performance Check A: Two pure strains of tulips were crossed. In the second-generation offspring of this cross, there were 163 plants with red flowers and 48 plants with yellow flowers.

1. What did the flowers of the first-generation offspring look like?
2. What did the flowers of the parent plants look like?

Remediation: (1) If the student had difficulty with the 3-to-1 ratio, see the Remediations for WYY-01-Exc 2-1-1 and WYY-01-Exc 2-1-2. (2) If he could not predict the parent plants and the first-generation offspring when given the second-generation ratio of 3 to 1, you may wish to discuss this concept with him. Figure 2-2, page 30, and Figure 4-1, page 43, will aid in this discussion. (3) Refer him to Self-Evaluations 3-3 and 3-4.

Cleans up the work area at the close of class.

WYY 01 Core 21

The student chooses to close the laboratory activity period promptly upon receiving notification of the time to do so.

Student Action: Ceasing the ongoing laboratory activity when notified of the time, returning materials in usable, clean condition to storage, and participating in work area cleanup, on at least three separate occasions when being observed by the teacher without his knowledge.

Teacher's Note: The opportunity for assessment of this objective arises almost every day during the course of regularly assigned laboratory activities. Use a few minutes of class time for group instruction early in the school year, and almost every week for reinforcement, to discuss the role of the student in the ISCS learning environment. To encourage personal responsibility in the student, discuss the reasons for his closing his activities promptly (to allow time for himself and others for lab-closing activities), returning materials to storage in clean condition (to facilitate their use by others), and participating in area cleanups (to leave the area as clean as he found it).

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) If a student fails to accept this responsibility, approach him individually and review the reasons for his acceptance of it. Emphasize the social responsibility for cooperation in the learning environment for the good of all students. Point out that he has received the benefit of other students' provisions for others as well as for themselves. (2) Do not, at first, suggest that he may lose his privileges unless he cooperates. But if he doesn't cooperate after you observe his behavior several times, ask him if he can suggest a proper penalty. (3) An alternative remedy may be to request him to assist in the process of overall classroom accounting of the materials for a period of time until he recognizes the importance of the student's role. (4) Do not use extra cleanup as a penalty for not cleaning up properly. In other words, don't use something as a penalty that you want done willingly.

WYY 01 Core 22

Cooperates with lab partners.

The student chooses to cooperate with fellow students in the laboratory.

Student Action: Being polite, waiting his turn, being orderly when moving about, and observing the right of his classmates to work without being unnecessarily disturbed, when observed without his knowledge by the teacher or another designated person on at least three occasions.

Teacher's Note: The opportunity for assessment of this objective arises almost every day during the course of regularly assigned laboratory activities. Use a few minutes of class time at the beginning of a session for a whole-group discussion early in the school year and several times later on to discuss the need for cooperation with and consideration of other students. Some particular points for discussion include being polite, waiting patiently, not making others wait longer than necessary, being orderly when moving about, and observing the right of others not to be disturbed. Talk about each student's accepting the personal responsibility for his own behavior in the group situation.

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) If a student fails to accept any of these responsibilities, approach him privately and review the reasons for his lack of cooperation with his fellow students. Suggest that he pay some attention to changing his behavior to more acceptable standards. (2) Find out if the student feels that he is behaving in a less than acceptable way. If so, ask him whether he feels some penalty should be imposed and what he thinks a suitable penalty would be.

WYY 01

Returns equipment promptly to storage areas.

The student chooses to show personal responsibility for returning laboratory equipment promptly to the proper storage places as soon as it is no longer needed, during the class period, and not just at the end of the period.

Student Action: Returning equipment and materials no longer needed to the proper storage places on at least three occasions when observed by the teacher or another designated observer without his knowledge of being checked.

Core 23

Teacher's Note: This objective may be assessed at any time the student is responsible for learning activities requiring the use of equipment and supplies. Use a few minutes of class time for group discussion of the reasons for returning equipment to storage areas promptly when it is not being used by the student or by his group. The reasons include (1) the short supply of certain items and the need to cooperate with others, (2) the chances of equipment's being misplaced, (3) the possibility of accidental damage to equipment, and (4) the greater opportunity for pilferage by an irresponsible student when things are disorganized.

Performance Check A: Your teacher will observe you for this check when he can

Remediation: In a private conference, discuss the reasons for the student's cooperation in this request. Ask for that cooperation. See also Remediations (1), (2), and (3) for WYY-01-Core-21.

Responds to text questions.

WYY 01 Core 24

The student chooses to write in his *Record Book* the answers to 90% or more of the textbook questions.

Student Action: Exhibiting the written responses when requested to do so. At least nine out of ten questions should have responses, be they correct or incorrect.

Teacher's Note: It is intended that this objective be assessed throughout the year. Such a check provides opportunities to encourage students to work nearer their capacities while remaining independent of the teacher. Use a few minutes of class time for a group discussion of the reasons for writing the answers in the *Record Book*. Writing in the *Record Book* serves (1) to help the student think through what he sees and does, (2) to preserve ideas for future reference, (3) to make a record of the student's progress through the core, (4) to provide the teacher with a source of input for analyzing the student's difficulties and progress, and (5) to help the student learn the background ideas for conceptual understanding. Writing in the *Record Book* is "in"; writing in the text is "out."

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) In a private conference, discuss with the student the ideas enumerated and ask why he chooses not to write the answers. (Perhaps he cannot write!) Evaluate his reasons and counsel him accordingly. Encourage him to follow the pattern of his classmates and set down his ideas as they are doing. (2) Have him read "Notes to the Student," pages viii and ix in his text. (3) Follow up in a few days to determine his actions.

WYY 01 Core 25

Shows care for laboratory materials.

The student chooses to show proper care and use of ISCS laboratory materials.

Student Action: Using the materials only for their intended purpose or requesting permission to do other specific experiments with them when being observed without his knowledge by the teacher or another designated person on three or more occasions.

Teacher's Note: This objective may be assessed at any time that the student is responsible for a learning activity in which equipment and supplies are required. Use a few minutes of class time for a whole-group discussion of the reasons for handling laboratory materials properly. Such reasons include: (1) If damaged, they are lost to use by students who need them now. Short supply means waiting in line. (2) They cannot readily be replaced. Replacement usually takes several months at best. (3) If materials are handled properly, they may be used for other than regular activities (with the permission of the teacher and after making a proper request).

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) In a private conference, ask the student why he chooses to mishandle equipment. Help him to evaluate his reasons, and ask for his cooperation in the future. If he agrees, reassess the objective later. (2) If after the conference he still does not agree, ask him if he feels that he should be penalized and what he thinks should be an appropriate penalty. Give him another opportunity for compliance. (3) If he is still uncooperative, apply a penalty for mishandling equipment. This may mean denying him use of the equipment either temporarily or permanently or taking some other suitable action.

WYY 01 Exc 1-1 1

Defines the word *cross* as it is used in the study of inheritance.

The student recalls the definition of the word *cross* as used in genetics.

Student Action: Stating, in effect, that in genetics the word *cross* is defined as the planned mating of two organisms of different strains.

Performance Check A: In reporting experiments done to find out how characteristics are inherited, the word *cross* is often used. Define the word *cross* as it is used in such reports.

Remediation: (1) Have the student review the paragraph following question 1 of Excursion 1-1. (2) Ask him if either Figure 1-3 or Figure 1-4 represents a cross. If necessary, explain that Figure 1-4 represents a cross because it involves mating two different strains (types of individuals), whereas 1-3 represents mating because only one strain (type of individual) is involved. (3) Discuss the mating of fruit flies in Chapter 1 and its relationship to the term *cross*. (4) Have the student give you an example of a cross as related to the variations in the characteristics of peas in Chapter 3.

Recognizes an operational definition.

WYY 01 EXC 1-2 1

The student applies the concept that an operational definition has two parts, one telling how to determine whether the variation is present or not and the other telling how to measure the amount of the variation present.

Student Action: Selecting the definition which states a way to detect and a way to measure the term being defined and stating the essence of the concept.

A, B, and **C:** Definition b

Performance Check A: Below are two definitions of ways in which people differ. Study these definitions, and answer the two questions that follow.

Definition a: A person's *treasure-finding index* is his ability to find valuable objects which have been buried.
Definition b: A student's *sprint index* is a measure of how rapidly he can run for short distances. It is measured by timing how long it takes the student to run 100 meters on a cinder track.

1. Which of the above is an operational definition?
2. Explain the reason for your answer.

Remediation: (1) Have the student read the second, third, and fourth paragraphs on page 6. (2) Review the student's answers to questions 1-4 and 1-5 on page 7. (3) Review his answers to Self-Evaluations 1-1 and 1-2.

States the two questions that an operational definition answers.

WYY 01 EXC 1-2 2

The student recalls the two questions that an operational definition should answer about the entity being defined.

Student Action: Stating the essence of the two questions, "How can I tell when I have some?" and "How can I tell how much I have?"

Performance Check A: Whenever possible, an operational definition of anything should answer two questions. What are the questions that it should answer?

Remediation: (1) Have the student review Excursion 1-2. (2) If a copy of *Investigating Variation* is available, have him review pages 6 and 7. (3) Check his answer to Self-Evaluation 1-1.

WYY
01
EXC
1-3
1

States the reason for small numbers of insects during the winter.

The student applies the concept of the influence of temperature on the life cycle of insects.

Student Action: Stating, in effect, that cool temperatures can prevent insects from completing their life cycles.

Performance Check A: Victor was crossing fruit flies during the winter. He stored his vials on the shelf next to the window. Some of his crosses were very slow in hatching, and some never developed into adults at all. What was the most likely cause of Victor's problems?

Remediation: (1) Refer the student to Table 1 of Excursion 1-3 on page 94. (2) Question the student as to what occurred in the life cycle of the fruit fly at cool temperatures. (3) Check his response to question 1 on page 94, and if necessary, discuss that question and Table 1 with him.

WYY
01
EXC
1-4
1

States the total number of bits for a feature in a prior generation of ancestors.

The student applies the concepts that the number of ancestors doubles in each preceding generation and that each person has two bits for each feature.

Student Action: Responding with the number *sixteen.*

Performance Check A: What is the total number of bits of information that all of your great-grandparents had for the feature eye color?

Remediation: (1) Refer the student to Figure 1 on page 95. (2) Review the student's answers to questions 1 and 3 on page 96.

WYY
01
EXC

Decides whether genetic features can be traced to ancestors.

The student applies the concept that a given genetic feature is determined by chance.

Student Action: Responding negatively and with the notion that it cannot be determined because the ancestor who contributes a specific genetic feature is determined by chance.

Performance Check A: Peter has blue eyes. His great-grandfather Lucas had blue eyes, his great-grandfather Joseph had hazel eyes, and his great-grandmother Mary had blue eyes.

1. Can you determine which of his three great-grandparents contributed the bits for Peter's blue eyes?
2. Explain your answer.

1-4
2

Remediation: Review the student's answers to questions 4 and 5 on page 96.

States the procedure for calculating a rough ratio.

WYY
01
Exc
2-1
1

The student applies a procedure for calculating a rough ratio that involves dividing the smaller number into the larger number and itself and expressing the ratio in the standard format.

Student Action: Stating the rough ratio in the standard format to within an accuracy of ±0.2.

A: 2.1 ±0.2 to 1
B: 2.1 ±0.2 to 1
C: 3.1 ±0.2 to 1

Performance Check A: Mary counted 8 boys and 17 girls in her class. What is the rough ratio of girls to boys in her class? Express the ratio to the nearest tenth, or 1 decimal place.

Remediation: (1) Refer the student to Excursion 2-1, pages 99 and 100, where the calculation of a rough ratio is presented. (2) Check his answers to questions 1 through 4 on page 101. (3) If necessary, review these calculations with him. (4) Check his response to Self-Evaluation 2-2a.

Converts rough ratios to rounded-off ratios.

WYY
01
Exc

The student applies the rules for rounding off rough ratios to the nearest whole number.

Student Action: Converting a rough ratio whose fractional part is 0.5 or larger to the next highest whole number and a rough ratio whose fractional part is 0.4 or smaller to the next lowest whole number in at least three of the four cases.

A: 1. 2 to 1, 2. 3 to 1, 3. 8 to 1, 4. 16 to 1
B: 1. 3 to 1, 2. 2 to 1, 3. 7 to 1, 4. 13 to 1
C: 1. 5 to 1, 2. 3 to 1, 3. 9 to 1, 4. 13 to 1

2-1
2

Performance Check A: Bill calculated the rough ratios shown below. Convert these to rounded-off ratios.

1. 2.1 to 1
2. 2.9 to 1
3. 8.3 to 1
4. 15.7 to 1

Remediation: (1) Suggest that the student review page 100, where the rules for rounding off rough ratios are presented. (2) Check the student's responses to questions 2, 3, and 4 on page 101, where he calculated rounded-off ratios. (3) Review with him his response to Self-Evaluation 2-2.

WYY 02

Chapters 4 and 5

Excursion 4-1

Performance Check

Summary Table

Objective Number	Objective Description
WYY-02-Core-1	States the appearance of the first-generation offspring and pure-strain parents
WYY-02-Core-2	Predicts the ratio of the variations in the second-generation offspring
WYY-02-Core-3	Recognizes the relationship between parent and offspring feature variations
WYY-02-Core-4	Names the science dealing with patterns of inheritance
WYY-02-Core-5	States the assumptions of the one-bit model of inheritance
WYY-02-Core-6	States a reason why the one-bit model is not satisfactory
WYY-02-Core-7	Selects the most important reason for accepting a model
WYY-02-Core-8	States the assumptions of the two-bit model of inheritance
WYY-02-Core-9	Predicts the appearance of first- and second-generation offspring
WYY-02-Core-10	Explains why a plant which is pure strain for a masked (recessive) variation is used in test
	crosses
WYY-02-Core-11	Discusses data, using the two-bit model
WYY-02-Core-12	Recognizes what to do when a model does not explain data
WYY-02-Core-13	States why organisms which are pure strain for a masking variation are not used in test
	crosses
WYY-02-Core-14	Determines if an unknown plant is pure strain, based on test results
WYY-02-Core-15	Uses first-generation data to determine if an unknown plant is pure strain
WYY-02-Core-16	Explains the appearance of a variation in first-generation offspring of different pure-strain
	organisms

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q	T	√				applies	
				Q		√				applies	
				Q		√				classifies	
				Q		√				recalls	
				Q						recalls	
				Q		√				recalls	
				Q		√				classifies	
				Q		√				recalls	
				Q	T	√				applies	
				Q		√				recalls	
				Q	T					applies	
				Q		√				recalls	
				Q						applies	
				Q		√				applies	
				Q		√				applies	
				Q		√				applies	

WYY
O2

Objective Number	Objective Description
WYY-02-Core-17	Defines *recessive bit*
WYY-02-Core-18	Defines the term *dominant bit*
WYY-02-Core-19	Interprets the notation used to label feature variations
WYY-02-Core-20	Devises symbols to represent dominant and recessive bits
WYY-02-Core-21	States whether a variation is dominant or recessive
WYY-02-Core-22	States a possible pair of bits for each of several individuals
WYY-02-Core-23	Recognizes the factor governing prediction in genetics
WYY-02-Core-24	Constructs an inheritance chart from data
WYY-02-Exc 4-1-1	States a ratio of feature variations after completing a 2 X 2 chart
WYY-01-Core-8R	States an operational definition of *pure strain*
WYY-01-Core-13R	Selects the appearance of first- and second-generation offspring
WYY-01-Core-14R	Predicts the ratio of variations in second-generation offspring
WYY-01-Exc 1-4-2R	Decides whether genetic features can be traced to ancestors
WYY-01-Exc 2-1-1R	States the procedure for calculating a rough ratio
WYY-01-Exc 2-1-2R	Converts rough ratios to rounded-off ratios

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				recalls	
				Q		✓				recalls	
				Q		✓				classifies	
				Q		✓				applies	
				Q		✓				applies	
			P	Q	T					generates	
				Q						applies	
				Q	T			✓		applies	
				Q	T	✓				applies	
						✓				recalls	
				Q		✓				applies	
						✓				applies	
						✓				applies	
						✓				applies	
				Q		✓				applies	

WYY 02 Core 1

States the appearance of the first-generation offspring and pure-strain parents.

The student applies the concept that one of the parent fruit flies and all of the first-generation offspring showed the feature variation shown by three-quarters of the second-generation offspring and that the other parent showed the variation shown by the remaining second-generation offspring.

Student Action: Responding, in effect, that one of the original parent fruit flies and the entire first-generation offspring showed the variation shown by three-quarters of the second-generation offspring fruit flies and the other original parent showed the other variation shown in the second-generation offspring.

A: 1. one parent red-eyed and the other parent orange-eyed, 2. all first-generation offspring red-eyed

B: 1. one parent long-bristled and the other parent short-bristled, 2. all first-generation offspring long-bristled

C: 1. one parent cross-veined and the other parent not cross-veined, 2. all first-generation offspring cross-veined

Performance Check A: James has the second-generation offspring of a cross between two pure strains of fruit flies. He has lost his records of the appearances of the original parents and the first-generation offspring. Suppose that he has 38 red-eyed flies and 12 orange-eyed flies in the second-generation offspring.

1. State the eye color of each of the original pure-strain parents.
2. State the eye color of the first-generation offspring of this cross.

Remediation: (1) Refer the student to Activity 1-19 on page 19, as well as to questions 1-12 and 1-13. It may be necessary to point out that the feature which varies in the check should be substituted for the feature shown in the illustration. (2) Have the student evaluate his response to Self-Evaluation 3-4, using the acceptable response as a model. (3) Give the student the peas from packet #6 and tell him that the variations are smooth and wrinkled texture and that the seeds are the second-generation offspring of a cross between two pure-strain seeds. Ask the student to determine the first-generation offspring and the parents. (4) After he has determined them, ask him to get packet #5, which are from first-generation offspring, and #3 and #4, which are the same as the original parents.

WYY 02

Predicts the ratio of the variations in the second-generation offspring.

The student applies the concept that three-quarters of the second-generation offspring of a cross between pure-strain parents with different variations of one feature will show the same variation shown by one of the original parents and all of the first-generation offspring and that the remaining one-quarter of the second-generation offspring will show the variation shown by the other original parent.

Core 2

Student Action: Predicting that the ratio of occurrence is three of the variation present in the first-generation offspring to one of the other variation.

A: 3 red to 1 yellow, or ¾ red-eyed and ¼ yellow-eyed
B: 3 normal to 1 yellow, or ¾ normal body color and ¼ yellow-bodied
C: 3 long to 1 short, or ¾ long-bristled and ¼ short-bristled

Performance Check A: Jennifer crosses two pure-strain fruit flies, one with red eyes and the other with yellow eyes. She finds that all the first-generation offspring of this cross have red eyes.

The first-generation offspring are then crossed with each other. Predict the ratio of red-eyed fruit flies and yellow-eyed fruit flies that will result from this second cross.

Remediation: (1) If the concept of ratios is a problem, refer the student to Excursion 2-1 on page 99. (2) Have him review pages 27 through 29 of the text by himself. (3) Then review with him Figure 2-2 and his responses to questions 2-6, 2-7, 2-8, and 2-9. If necessary, have him recalculate the ratio. (4) Have him do an alternate check.

WYY O2 Core 3

Recognizes the relationship between parent and offspring feature variations.

The student classifies the pattern by which features of the parents are passed to the offspring.

Student Action: Selecting the statement that offspring generally show some features in common with each of their parents.

A: c
B: d
C: b

Performance Check A: Choose the statement below that best describes the pattern by which features are passed from parents to offspring.

a. The offspring show the same features as their female parent.
b. The features of the offspring are different from those of both of their parents.
c. The offspring generally show some features in common with each of their parents.
d. The offspring show the same features as their male parent.

Remediation: (1) Refer the student to paragraph 1, page 1, and to Figure 1-3 on page 8. (2) Review the student's completed Figure 2-1 and his response to Problem Break 2-1. Ask him whether, in the case of beans and corn, the offspring often had some feature variations in common with at least one of their parents. (3) Have him cite examples of this phenomenon in Chapter 3.

WYY

Names the science dealing with patterns of inheritance.

The student recalls that genetics is the science that deals with the study of patterns of inheritance.

O2 Core 4

Student Action: Stating the word *genetics*.

Performance Check A: What is the name of the science which deals with the patterns of inheritance?

Remediation: (1) Refer the student to the first paragraph on page 23. (2) If the student doesn't know the term *genetics* at this point, he should learn it by using it in later chapters and excursions.

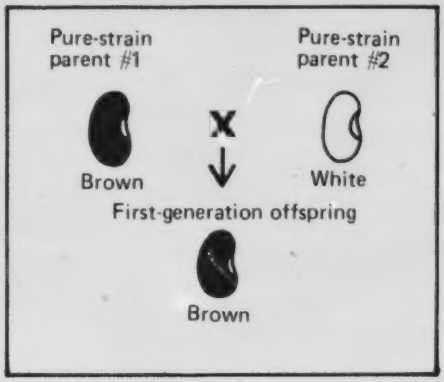
WYY O2 Core 5

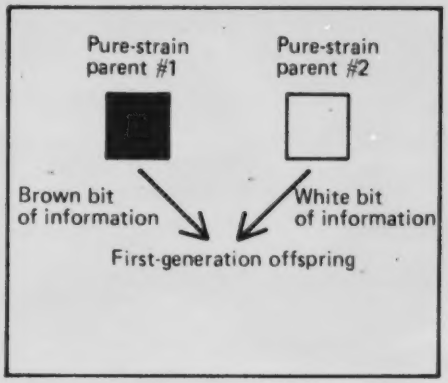
States the assumptions of the one-bit model of inheritance.

The student recalls the assumptions of the one-bit model of inheritance.

Student Action: Stating that each individual has just one bit of information for each feature and that it is a matter of chance whether an offspring receives its bit from one parent or the other.

Performance Check A: The figures below show a possible way to explain a cross between brown beans and white beans, using the one-bit model of inheritance. What are the assumptions of the one-bit model of inheritance?





Remediation: (1) Check the student's answer to Self-Evaluation 4-1, part b. (2) Have him read the next to the last paragraph on page 44. (3) Have him review Activity 4-1 on page 45.

WYY

States a reason why the one-bit model is not satisfactory.

The student recalls a reason why the one-bit model is not a satisfactory model for inheritance.

Student Action: Stating one of the following notions to explain why the one-bit model is not a satisfactory model for inheritance: (1) it doesn't explain the inheritance of the feature variations in the second-generation offspring of certain crosses (without making wild assumptions) or (2) it doesn't allow prediction of the ratios of the variations in the second-generation offspring of certain crosses.

O2 Core 6

Performance Check A: Why is the one-bit model of inheritance not a satisfactory model of inheritance for most features?

Remediation: (1) Have the student rethink questions 4-2 through 4-3 on page 46. (2) Review with him Activity 4-2 and Problem Break 4-1 on page 47. (3) Check his answer to Self-Evaluation 4-1. (4) Have him redo the check, orally if you have time to listen.

Selects the most important reason for accepting a model.

The student classifies one model as better than another.

WYY O2 Core 7

Student Action: Selecting the option to the effect that one model agrees more closely with experimental evidence.

A: b
B: c
C: d

Performance Check A: There are two models for light – the wave model and the ether model. Select the most important reason below for accepting one model rather than the other.

a. One model was developed more recently.
b. One model agrees more closely with the experimental evidence.
c. One model involves less math and is easier to understand.
d. A famous scientist developed one of the models.
e. Someone told you that one model is right and the other is wrong.

Remediation: (1) Have the student review page 44, "Building a Model." (2) You may wish to discuss the characteristics of a good model. (See page 44 of the Teacher's Edition.) (3) When the student seems to grasp the concepts, ask him to explain why he rejected the one-bit model and accepted the two-bit model in Chapter 4. (Refer to Problem Break 4-2 on page 53.) (4) Have him review Self-Evaluation 4-1.

States the assumptions of the two-bit model of inheritance.

The student recalls the assumptions of the two-bit model of inheritance.

WYY O2

Core 8

Student Action: Stating the effect of at least three of the following:

1. every individual has two bits of information for each feature,
2. one bit for each feature is passed from each parent to the offspring,
3. the bit from one variation can mask the other bit, and
4. chance determines which of the two bits is passed from a parent to an individual offspring.

Performance Check A: State the assumptions of the two-bit model of inheritance.

Remediation: (1) Suggest that the student review page 53, where the assumptions of the two-bit model are summarized. (2) If necessary, have him review Activities 4-3 through 4-6, which investigate the two-bit model. (3) Refer him to Self-Evaluations 4-1 and 4-2.

WYY 02 Core 9

Predicts the appearance of first- and second-generation offspring.

The student applies the concept of the two-bit model to the inheritance of a feature.

Student Action: Predicting that only the unmasked color would appear in the first-generation offspring and that a 3-to-1 ratio of unmasked color to masked color would appear in the second-generation offspring.

A: 1. All purple, 2. 3 purple to 1 white
B: 1. All red, 2. 3 red to 1 yellow
C: 1. All yellow, 2. 3 yellow to 1 white

Performance Check A: The inheritance of flower color in lilacs follows the two-bit model. Purple color masks white color. Suppose you crossed pure-strain white lilacs with pure-strain purple lilacs.

1. What will be the color of the flowers of the first-generation offspring of this cross?
2. What will be the color of the flowers of the second-generation offspring of this cross? Include a ratio in your answer.

Remediation: (1) See the related Remediations for WYY-01-Core-13 and WYY-01-Core-14, which deal with the results of the first- and second-generation offspring. (2) Check the student's response to questions 4-12, 4-14, and 4-21. Also check Tables 4-1 and 4-2. (3) If the student has difficulty applying the concept of the two-bit model, you may wish to discuss this with him. (4) Refer him to Self-Evaluation 4-4.

WYY 02

Explains why a plant which is pure strain for a masked (recessive) variation is used in test crosses.

The student recalls the reason that a test plant which is pure strain for the masked (recessive) variation of a feature is used for a test cross with an unknown plant rather than a plant which is pure strain for the masking (dominant) variation.

Student Action: Responding to the effect that such a plant is used because the bits from the known plant will not mask the bits from the unknown plant.

Core 10

Performance Check A: John used a plant that is pure strain for the masked (recessive) variation of a feature in a test cross. Why wouldn't a plant that is pure strain for the masking variation be used in the cross?

Remediation: (1) Suggest that the student review pages 55 and 56 where the test cross was introduced. (2) Check his responses to questions 4-24 and 4-28 on page 56. Also review his responses to Problem Break 4-4 and Self-Evaluation 4-9 with him.

Discusses data, using the two-bit model.

WYY 02 Core 11

The student applies the concept that a model can explain only experimental data that agree with the predictions made by the model.

Student Action: Responding negatively and, in effect, that the data disagree with the ratios predicted by the two-bit model of inheritance and, therefore, the model cannot explain the results.

Performance Check A: Henry crossed two pure strains of plants. One was pure strain for yellow seeds (gg), and the other was pure strain for green seeds (GG). His data are shown below.

GENERATION	PLANTS WITH YELLOW SEEDS	PLANTS WITH GREEN SEEDS
Parents	1	1
1st-generation offspring	0	20
2nd-generation offspring	73	71

1. Can you explain these data, using the two-bit model of inheritance?
2. Explain your answer.

Remediation: (1) Have the student review pages 44 through 47 and state if the correct ratios were predicted for the second-generation offspring by the one-bit model. Then ask him if the one-bit model could explain the results of his activities and why. (2) Suggest that he review Problem Break 4-2 on page 53, which tested his understanding of the two-bit model. (3) If he had difficulty with Problem Break 4-2, you may wish to discuss the characteristics of the two-bit model with him. (4) Have him reassess the data given in the check.

WYY O2 Core 12

Recognizes what to do when a model does not explain data.

The student recalls the preferred course of action when a model does not explain new experimental data.

Student Action: Selecting the answer that includes modifying the two-bit model to explain both the new and the old data.

A: d
B: c
C: a

Performance Check A: Suppose that a scientist crossed two plants and found that the offspring were not explained by the two-bit model. He repeated the cross several times and got the same results. Select the answer that best describes what he should do next.

a. Ignore the results of his experiment because they do not agree with the two-bit model.
b. Devise a new model that explains only the new results.
c. Publish a paper giving his data and stating that the two-bit model is wrong and must be thrown out.
d. Try to change the two-bit model so that it explains both his new data and the old data.
e. Change his data to agree with the two-bit model.

Remediation: (1) Refer to Problem Break 4-1 on page 47 and ask the student if the suggestions given for the one-bit model can be used in dealing with a similar problem which considers the two-bit model. (2) If in the check the student selected either the choice "change his data to agree with the two-bit model" or the choice "ignore the results of his experiment," discuss with him the basically dishonest nature of these options.

WYY O2 Core 13

States why organisms which are pure strain for a masking variation are not used in test crosses.

The student applies the concept that a plant that is pure strain for the masking variation of a feature is not used for a test cross with an unknown.

Student Action: Stating, in effect, that he cannot identify the bits for that feature of the unknown because a cross involving a known organism which is pure strain for the masking variation produces the same offspring no matter what the bits for the unknown are.

Performance Check A: Susan wanted to find out if a tall pea plant she had was pure strain. She knew that the bit for tallness would mask the bit for dwarfness in peas. She crossed her unknown plant with one that she knew was pure strain for tallness. All the first-generation offspring of this cross were tall.

1. Was the unknown plant pure strain for tallness?
2. Explain your answer.

Remediation: (1) Have the student diagram the cross in the check. (2) If necessary discuss this cross with him. Figures 4-5A and B will be helpful to him in determining why the masked variation cannot be used in a test cross. (3) Check his responses to questions 4-22, 4-23, and 4-24. (4) See the Remediation for WYY-02-Core-10 if the student has difficulty understanding why the pure strain for the masked variation must be used in a test cross.

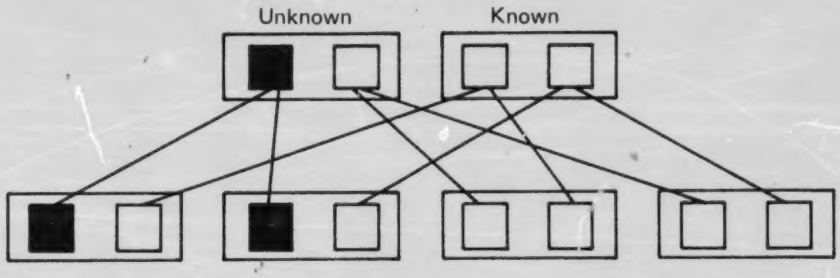
WYY 02 Core 14

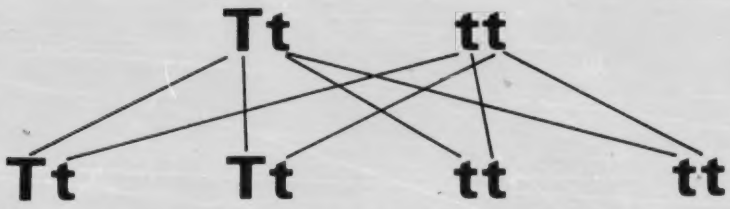
Determines if an unknown plant is pure strain, based on test results.

The student applies the concept that if half the offspring of a cross show the same variations as an unknown plant and the other half show the same variation as a pure-strain known plant, the unknown plant is not pure strain for the feature.

Student Action: Responding negatively and to the effect that the unknown plant is not pure strain, since half of the offspring of the cross show the same variation as the unknown plant and the other half show the same variation as the pure-strain known plant.

A, B, and **C:** If the student uses a diagram as part of his answer, the pattern of the bits should be similar to that shown in either example below.





Performance Check A: Roland wants to determine if a tall wheat plant is pure strain for height. He knows that the bit for tallness will mask the bit for dwarfness. He test-crosses the unknown tall wheat plant with a pure-strain dwarf wheat plant. Half of the first-generation offspring of this cross are tall and half are dwarf.

1. Is the unknown tall wheat plant pure strain for height?
2. Explain your answer. You may wish to include a diagram in your explanation.

Remediation: (1) Check the student's answers to questions 4-25 through 4-29 on page 56. (2) Refer him to Figure 4-6 on page 56.

WYY 02 Core 15

Uses first-generation data to determine if an unknown plant is pure strain.

The student applies the concept that according to the two-bit model if the offspring of a cross all show the same variation as the unknown parent plant, the unknown plant is pure strain for the feature.

Student Action: Responding positively and, in effect, that this is true because the first-generation offspring all show the same variation as the unknown parent plant.

Performance Check A: Matt wants to find out if a tall bean plant is pure strain for tallness. He knows that the bit for tallness masks the bit for dwarfness in beans. He test-crosses the unknown tall plant with a pure-strain dwarf bean plant. The first-generation offspring of this cross are all tall.

1. Is the unknown tall bean plant pure strain for tallness?
2. Explain your answer.

Remediation: (1) Suggest that the student diagram the cross in the check. If the unknown plant is pure or nonpure strain, what should the first-generation offspring look like? (2) Refer him to Problem Break 4-4 on page 57 and also to Self-Evaluation 4-5. (3) Check his responses to Problem Break 4-4 and also questions 4-27 and 4-29 on page 56.

WYY 02 Core 16

Explains the appearance of a variation in first-generation offspring of different pure-strain organisms.

The student applies the concept that all the first-generation offspring of a cross between two organisms that are pure strain for different variations show that variation of the feature which masks the other variation.

Student Action: Stating in effect that only one variation of a particular feature appears in the first-generation offspring because it masks the other variation of the feature shown by the other parent.

Performance Check A: A pure-strain plant with purple flowers is crossed with a plant that is pure strain for white flowers. All the first-generation offspring of this cross have purple flowers. Explain why there are no white-flowering plants among the first-generation offspring.

Remediation: (1) If the student does not understand the ferm *pure strain*, have him review the paragraph following Table 1-2 on page 8 and Figure 1-3 on the same page. (2) Have the student redo Activity 4-4. Ask him why he sees only one color. (3) Check the student's answers to questions 4-15 through 4-17 on page 50.

Defines *recessive bit*.

WYY O2 Core 17

The student recalls the definition of the term *recessive bit* as it is used in the two-bit model.

Student Action: Responding to the effect that a recessive bit in the two-bit model is a bit of genetic information for a feature that can be masked by a dominant bit for that feature.

Performance Check A: What does the term *recessive bit* mean as it is used in the two-bit model?

Remediation: (1) Refer the student to page 61 where *recessive bit* is defined. (2) Review his response to Self-Evaluation 5-1b. (3) Have him review the first two generations in Figure 4-1 and state which is the dominant and which the recessive trait and why.

Defines the term *dominant bit*.

WYY O2 Core 18

The student recalls the definition of the term *dominant bit* as it is used in a two-bit model.

Student Action: Responding to the effect that a dominant bit in the two-bit model refers to a bit of genetic information for a feature that will mask recessive bits for that feature.

Performance Check A: What does the term *dominant bit* mean as it is used in the two-bit model?

Remediation: (1) Review the student's response to Self-Evaluation 5-1a. (2) Refer him to page 61 where *dominant bit* is defined.

Interprets the notation used to label feature variations.

WYY O2 Core

The student classifies the feature variations as dominant or recessive.

Student Action: Indicating that the capital letters represent dominant feature variations and the lowercase letters represent recessive feature variations.

A: 1. recessive, 2. dominant, 3. dominant, 4. recessive
B: 1. dominant, 2. recessive, 3. recessive, 4. dominant
C: 1. recessive, 2. dominant, 3. recessive, 4. dominant

19

Performance Check A: Suppose you have the report of a study of the feature variations shown below which uses the symbols in the right-hand column of the table. Write the numbers of the feature variations listed below. After each number, state whether the feature variation is dominant or recessive.

FEATURE VARIATION	SYMBOL FOR THE BIT OF INFORMATION
1. Spotted seeds	b
2. Red flowers	M
3. Wrinkled pods	N
4. Yellow hair	j

Remediation: (1) Check the student's answer to Self-Evaluation 5-4. (2) Have him review the paragraph following question 5-5. (3) As an additional check, suggest that the student label the entries in Figure 4-1 on page 43 as either dominant or recessive.

WYY 02 Core 20

Devises symbols to represent dominant and recessive bits.

The student applies the convention that a bit for a dominant variation is represented by a single capital letter and a bit for a recessive variation is represented by a single lowercase letter.

Student Action: Writing symbols to represent dominant and recessive bits of information, using a capital letter for a dominant bit and a lowercase letter for a recessive bit.

A: 1. lowercase, 2. capital, 3. capital, 4. lowercase
B: 1. lowercase, 2. lowercase, 3. capital, 4. capital
C: 1. capital, 2. lowercase, 3. lowercase, 4. capital

Performance Check A: Write the numbers of the feature variations listed below. After each number, write a symbol to represent each of the feature variations.

1. Blue eyes (recessive)
2. Purple flowers (dominant)
3. Yellow body (dominant)
4. Wrinkled seeds (recessive)

Remediation: (1) Refer the student to page 61. (2) Also check Figure 5-1 in his *Record Book* to see if he used the symbols correctly. Have him explain the correct symbol usage for Figure 5-1.

WYY

States whether a variation is dominant or recessive.

The student applies the concept that the dominant variation of a feature masks the recessive variation of the same feature.

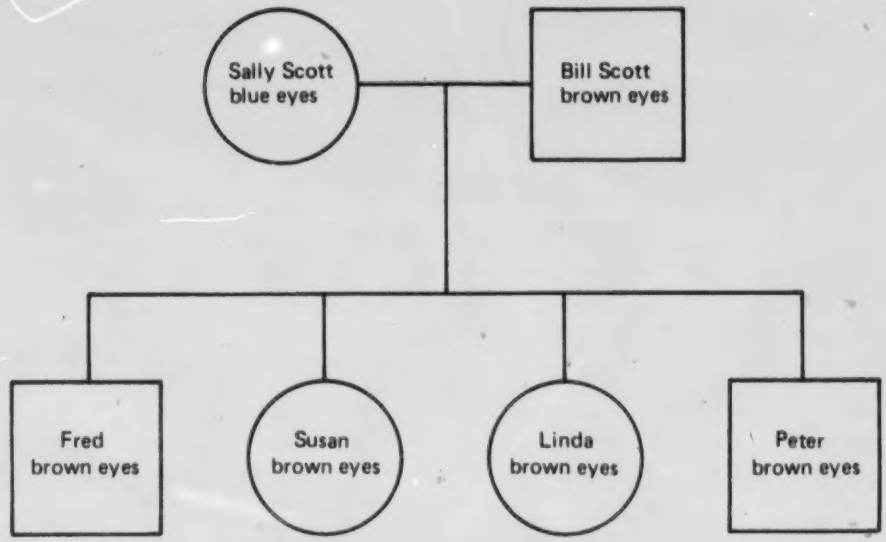
Student Action: Selecting as the dominant variation the variation which masks the other variation of the feature and as the recessive variation the variation which is masked by the other variation of the feature and stating the essence of the concept that the dominant variation masks the recessive variation.

A, B, and C: 1. brown eyes, 2. blue eyes

O2 Core 21

Performance Check A: Sally's parents and grandparents all had blue eyes. Bill's parents and grandparents all had brown eyes.

THE BILL SCOTT FAMILY



1. In the Bill Scott family which variation – blue eyes or brown eyes – is dominant?
2. Which variation is recessive?
3. State the reason for your answers to questions 1 and 2.

Remediation: (1) If the student cannot define *dominant* or *recessive*, have him review page 61 where these terms are introduced. (2) Suggest that he review Figure 5-1 and also questions 5-5 through 5-8. (3) Refer him to Self-Evaluation 5-2a.

States a possible pair of bits for each of several individuals.

The student generates a possible set of genetic bits for each individual shown in a three-generation family inheritance chart.

WYY O2

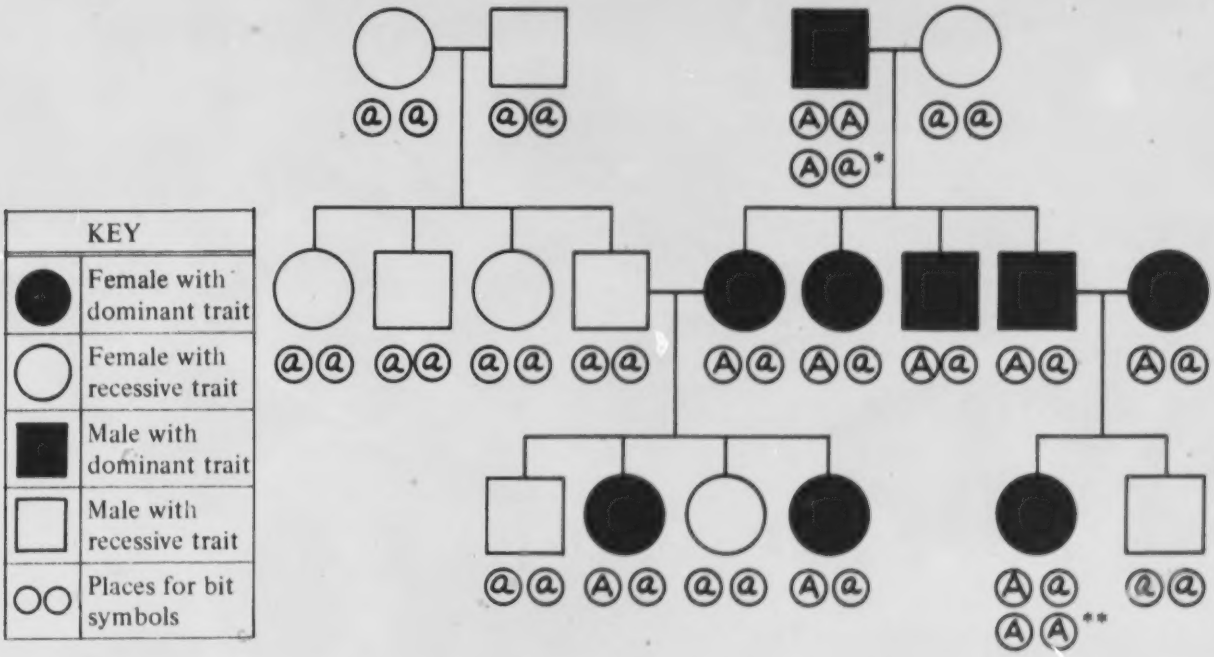
Special Preparations: You should have ready for your students either reproductions of the blank chart from the back of this book or suitable paper on which they can trace the chart.

Core 22

Student Action: Stating a possible genotype correctly for at least sixteen individuals shown in a chart. The genotypes must be in agreement with the following rules:

(a) individuals showing the recessive variation have two recessive bits,
(b) individuals showing the dominant variation may have either two dominant bits or one dominant and one recessive bit,
(c) the offspring of a mating with an individual who has two recessive bits must have at least one recessive bit,
(d) each parent of an individual showing the recessive variation must have at least least one recessive bit,
(e) a parent probably (but not necessarily) has two dominant bits if the dominant variation is shown by all the several offspring of a mating with an individual having two recessive bits, and
(f) a capital letter must be used to represent a dominant variation and a lowercase letter to represent a recessive variation.

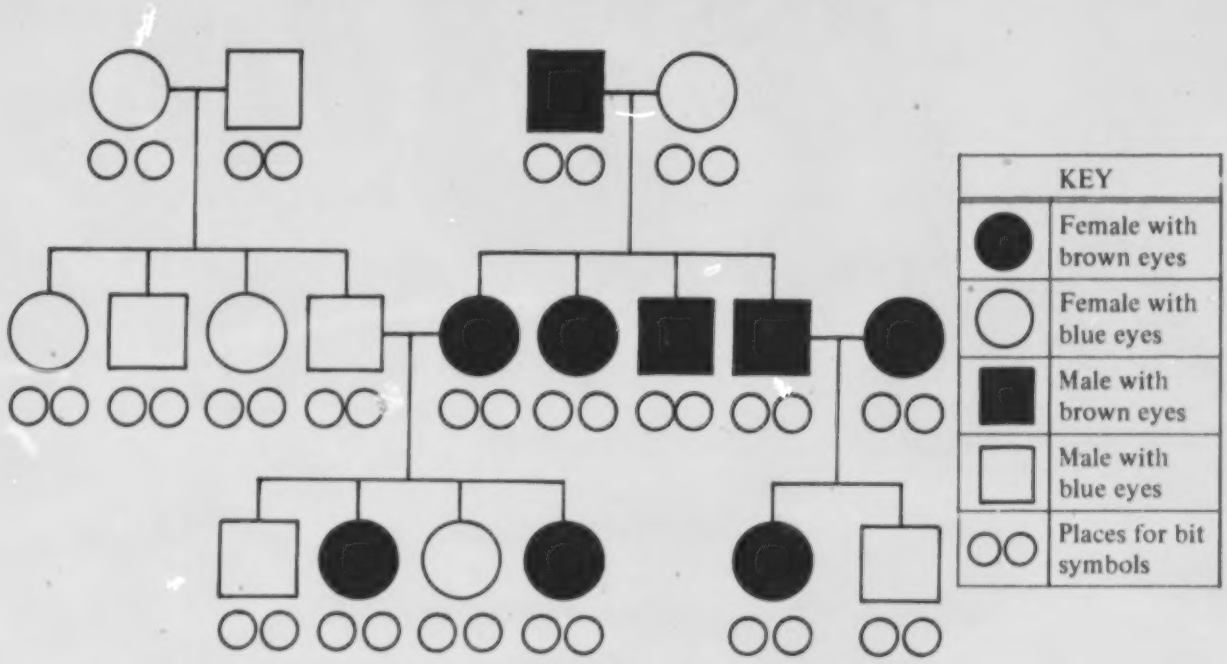
A, B, and **C:** The letter symbols change from check to check, but the pattern of capital and lowercase remains consistent as shown in the chart below.



*This is more likely to be AA, since all the offspring have an A. But Aa is possible.
**Either Aa or AA is possible, but Aa is twice as likely because of chance.

Performance Check A: A large family was studied to find the pattern of inheritance of blue eyes and brown eyes. Brown eyes were found to be dominant over blue eyes.

Ask your teacher for a copy of the chart below or paper to trace it. State a possible pair of bits of information that each person shown in the chart could have by writing the bit symbols in the small circles under each large symbol on your chart. Use B to represent the bit for brown eyes and b to represent the bit for blue eyes.



Remediation: (1) Check the student's answer to Self-Evaluation 5-3. (2) Check his answers to questions 5-5 through 5-8. (3) If the student has additional problems preparing the chart, discuss Figure 5-1, page 61. (4) The next day have the student do and explain an alternate check.

Recognizes the factor governing prediction in genetics.

WYY
O2
Core
23

The student applies the concept that predictions based on the parents' variations of a feature cannot be made with certainty for a particular offspring but rather only in terms of probability.

Student Action: Stating, in effect, that the feature variations that will be shown by the offspring cannot be predicted with certainty based on the information given. (Prediction for an individual at least one of whose parents is not known to be pure strain is probably not certain.)

Performance Check A: You have learned that the bit for tasting PTC is dominant over the bit for not tasting it. Suppose a man can taste PTC and his wife cannot. Nothing is known about their parents' ability to taste PTC.

1. Will their first child be a taster?
2. Explain your answer.

Remediation: (1) Have the student write possible letters for the variations involved in the cross and then diagram the two different crosses that are possible. Then have him state which of the possible offspring will be the first. If he thinks he can do that, have him explain how he knows. (2) Have him reassess the check, and if necessary, discuss this cross with him. (3) Refer him to Self-Evaluation 5-3.

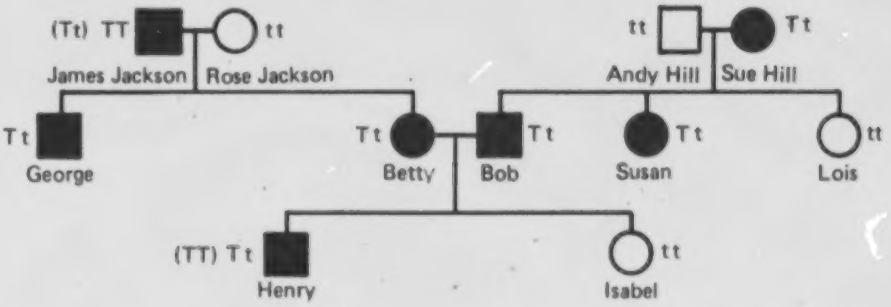
WYY 02 Core 24

Constructs an inheritance chart from data.

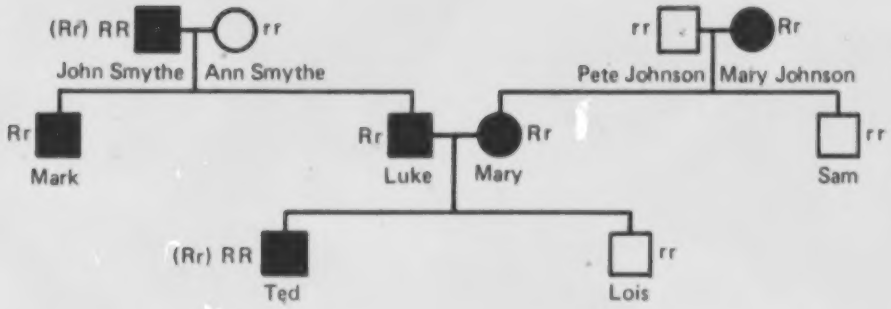
The student applies the conventions used in constructing an inheritance chart.

Student Action: Constructing an inheritance chart using the following conventions: each generation is in a single horizontal row, the generations are separated vertically with the oldest at the top, circles are used to represent females and squares are used for males, shading is used to distinguish individuals showing the dominant variation from individuals showing the recessive variation, near each square or circle the person's name and a possible pair of bits which that person may have are written, crosses (marriages) are indicated by a straight horizontal line joining the symbols of the partners, and the offspring of a cross are indicated by vertical lines originating from the cross line and terminating at the offspring.

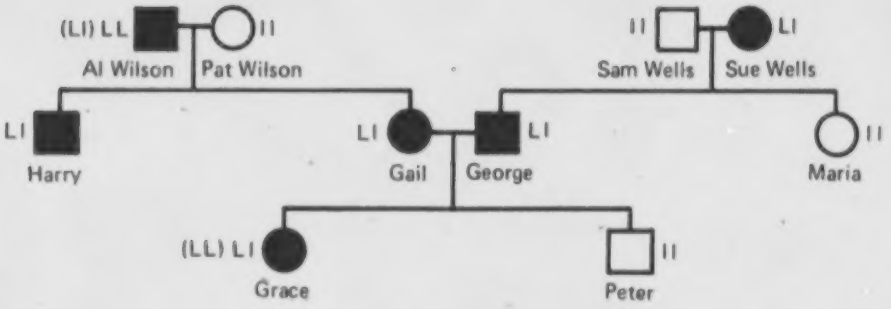
A:



B:



C:



Performance Check A: Construct an inheritance chart for the inheritance of the ability to taste PTC for the families described below. Use squares and circles and shading and nonshading. Near each square or circle, write the person's name and a possible pair of bits which that person may have. Use T for taster and t for nontaster.

Grandfather James Jackson is a taster, but Grandmother Rose Jackson is a nontaster. Their children, George and Betty, are tasters.

Grandfather Andy Hill is a nontaster, but Grandmother Sue Hill is a taster. Two of their children, Bob and Susan, are tasters. Their other child, Lois, is a nontaster.

Betty Jackson marries Bob Hill. Their boy, Henry, is a taster, but their other child, Isabel, is a nontaster.

Remediation: (1) If the student cannot draw the genetic inheritance chart, suggest that he review Figures 5-3 and 5-4 on pages 63 and 64. (2) You may also wish to check his responses to Problem Breaks 5-1 and 5-2 in which he was directed to make such a chart. (3) A discussion on making and using such a chart for a specific trait may be necessary. (4) Reassess the objective with an alternate check.

States a ratio of feature variations after completing a 2 X 2 chart.

WYY
O2
Exc
4-1
1

The student applies the procedure for determining the ratio of feature variations in the offspring of a cross, using a Punnett square.

Student Action: Constructing a Punnett square, combining the column and row headings to produce the chart entries, and stating the ratio of variations by counting the chart entries that represent the same feature variations.

A: 1.

	B	b
b	Bb	bb
b	Bb	bb

2. 1 black hair to 1 white hair

B: 1.

	R	r
r	Rr	rr
r	Rr	rr

2. 1 rough coat to 1 smooth coat

C: 1.

	R	r
r	Rr	rr
r	Rr	rr

2. 1 red flower to 1 yellow flower

Performance Check A: The bit for black hair (B) is dominant over the bit for white hair (b) in guinea pigs. Suppose you crossed a black-haired guinea pig (Bb) with a white-haired guinea pig (bb).

1. Use a chart like that shown below to determine the possible combinations of bits that the offspring could have.
2. What is the ratio of black-haired offspring to white-haired offspring?

Remediation: (1) Suggest that the student review pages 105 and 106 of Excursion 4-1, especially Figures 3 and 4 and questions 1, 2, and 3.

WYY 03

Chapters 6 and 7

Excursions 6-1 thru 7-7

Performance Check

Summary Table

Objective Number	Objective Description
WYY-03-Core-1	States the number of bits received for a stated number of features
WYY-03-Core-2	Predicts an individual's appearance based on bit symbols
WYY-03-Core-3	States actions to be taken when data contradict the predictions of a model
WYY-03-Exc 6-1-1	States why Mendel's study of inheritance was successful
WYY-03-Exc 6-1-2	Explains why Mendel's approach helped him to understand inheritance
WYY-03-Exc 6-2-1	Predicts the variations exhibited by first-generation offspring
WYY-03-Exc 6-2-2	Predicts the ratio of variations of two features in second-generation offspring
WYY-03-Exc 7-1-1	Predicts the appearance of offspring from a cross involving a blend
WYY-03-Exc 7-2-1	Predicts possible bits for sex-related variations
WYY-03-Exc 7-3-1	States whether a husband can blame his wife for the sex of their children
WYY-03-Exc 7-4-1	Predicts the appearance of and the bits carried by offspring for sex-linked features
WYY-03-Exc 7-5-1	States the cause of differences that develop in genetically identical living things
WYY-03-Exc 7-6-1	Predicts the effects of animals' coloration on population size
WYY-03-Exc 7-7-1	States whether features developed because of environmental factors will be observed in
	offspring
WYY-01-Core-8R	States an operational definition of *pure strain*
WYY-01-Exc 1-1-1R	Defines the word *cross* as it is used in the study of inheritance
WYY-02-Core-8R	States the assumptions of the two-bit model of inheritance

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				applies	
				Q		√				applies	
				Q						applies	
				Q						recalls	
				Q	T			√	√	generates	
				Q	T				√	applies	
				Q	T		√		√	applies	
				Q	T		√			applies	
			P	Q	T		√			applies	
				Q						applies	
			P		T				√	applies	
				Q						applies	
				Q						applies	
				Q						applies	
						√				recalls	
						√				recalls	
				Q		√				recalls	

WYY 03

Objective Number	Objective Description
WYY-02-Core-17R	Defines *recessive bit*
WYY-02-Core-18R	Defines the term *dominant bit*
WYY-02-Core-20R	Devises symbols to represent dominant and recessive bits
WYY-02-Core-22R	States a possible pair of bits for each of several individuals

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				recalls	
				Q		✓				recalls	
				Q		✓				applies	
			P	Q	T	✓				generates	

WYY O3 Core 1

States the number of bits received for a stated number of features.

The student applies the assumption of the two-bit model that the total number of bits an offspring receives from both parents is double the number of features.

Student Action: Stating as the number of bits for a given number of features twice as many bits as there are features given.

A: 18 bits
B: 14 bits
C: 10 bits

Performance Check A: A certain species of insect has nine features that show variation. They are eye color, eye shape, body color, body shape, length of antenna, size of wing, shape of wing, pattern of veins in the wing, and length of bristles. According to the two-bit model, what is the total number of bits that this insect received for all of these nine features?

Remediation: (1) Check the student's answers to questions 6-1, 6-2, and 6-3 on page 70. (2) Suggest that he do Excursion 6-1. (3) Discuss questions 1 through 8 on pages 109 and 110 to try to elicit these concepts. You may also want to do this with those students who want further information on this subject.

WYY O3 Core 2

Predicts an individual's appearance, based on bit symbols.

The student applies the concept from the two-bit model that an individual will show the dominant variation of a simple, dominant-recessive feature unless both genetic bits for this feature are for the recessive variation, in which case he will show the recessive variation, and the convention that dominant variations are represented by capital letters and recessive variations are represented by lowercase letters.

Student Action: Predicting the individual's appearance for specific features.

A: 1. red, 2. round, 3. long, 4. brown, 5. skinny
B: 1. long, 2. curly, 3. black, 4. unspotted, 5. brown
C: 1. small, 2. grey, 3. curved, 4. black, 5. dark

Performance Check A: A type of fly receives information for eye color, eye shape, wing shape, body color, and body shape. The possible variations of these features are shown below.

KEY				
FEATURE	BIT	VARIATION	BIT	VARIATION
Eye color	R	red	r	brown
Eye shape	s	round	S	slit shaped
Wing shape	L	long	l	short
Body color	B	brown	b	yellow
Body shape	F	fat	f	skinny

Use the two-bit model and the key above to determine the appearance of the fly that inherited the bits shown in the table below. List the feature number, and after the number state the variation of the feature that the fly will show. (Example: 1. red)

FEATURE NUMBER	FEATURE	BIT 1	BIT 2
1	eye color	R	R
2	eye shape	s	s
3	wing shape	l	L
4	body color	B	b
5	body shape	f	f

Remediation: (1) Determine whether or not the student knows why capital and lowercase letters are used. If not, refer him to the paragraph which follows question 5-5 on page 61. (2) Check Tables 6-1 and 6-2 in the *Record Book*, and have him review these tables. (3) Refer him to Self-Evaluation 5-4. (4) Have him do an alternate check.

States actions to be taken when data contradict the predictions of a model.

WYY
03
Core
3

The student applies the concepts that new data which contradict predictions based on an accepted model must themselves be verified and that if they are verified, the model must be modified or replaced.

Student Action: Stating that the experiment should be repeated and if the results are similar in sufficient instances, the model should be modified or replaced.

Performance Check A: Suppose you did an experiment with fruit flies and found that your results did not agree with what the two-bit model predicts.

1. What should you do to establish the value of your results?
2. How can your results affect the model?

Remediation: (1) Have the student review page 84 where an example was given for which the two-bit model needed modification. (2) Excursion 7-1, which describes how the two-bit model was modified in a particular case, may be helpful in showing a model's being revised to account for new data. (3) Refer the student to Self-Evaluations 7-2a and 7-3.

WYY 03 Exc 6-1 1

States why Mendel's study of inheritance was successful.

The student recalls reasons that Mendel was successful in understanding the patterns of inheritance.

Student Action: Stating the notion of two of the following three reasons that explain why Mendel was successful in studying inheritance patterns:

1. he studied one feature at a time,
2. he applied mathematics to his study, and
3. he devised a model to account for what he saw.

Performance Check A: Several people investigated patterns of inheritance before Mendel did. However, they were not successful in explaining the patterns they saw. State two reasons why Mendel was successful in understanding patterns of inheritance.

Remediation: Have the student refer to the paragraph following Figure 1 in Excursion 6-1, page 108.

WYY 03 Exc 6-1 2

Explains why Mendel's approach helped him to understand inheritance.

The student generates reasons why the systems approach, mathematics, and models were helpful to Mendel.

Student Action: Stating the effect of at least two of the following: (1) the systems approach is helpful because it allows one to examine a single feature at a time, (2) mathematics is helpful because it facilitates making accurate comparisons of data, and (3) a model is helpful for understanding patterns of inheritance because a model provides a basis for explaining what may be happening and a basis on which to make predictions.

Performance Check A: Several people unsuccessfully investigated inheritance before Mendel did. Mendel used the systems approach, mathematics, and a model. Explain the importance of each of these to scientific problems.

Remediation: (1) If the student doesn't understand why the systems approach is helpful, refer him to the first paragraph on page 108. Also see the Remediation for WYY-01-Core-12. (2) If he doesn't understand why mathematics is helpful, Excursions 2-1 and 4-1 may provide insight into the use of mathematics in the field of genetics. (3) If he failed to give a reason why a model is useful, refer him to page 44. You may wish to have a discussion with him on the characteristics of a model (page 44 of the Teacher's Edition).

WYY O3 EXC 6-2 1

Predicts the variations exhibited by first-generation offspring.

The student applies the concept that when two individuals that are pure strain for different variations of the same two features are crossed, the first-generation offspring all show the dominant variations of the two features.

Student Action: Predicting that all the first-generation offspring will show the dominant variations of the two features.

A: Purple flowers, wrinkled seeds
B: Tall zinnias, red flowers
C: Long wings, red eyes

Performance Check A: In sweet peas, the bit for purple flowers (P) is dominant over the bit for white flowers (p). The bit for wrinkled seeds (W) is dominant over the bit for smooth seeds (w). Suppose you had a sweet pea that was pure strain for purple flowers (PP) and for smooth seeds (ww). You crossed this plant with one that was pure strain for white flowers (pp) and wrinkled seeds (WW). Predict the appearance of the first-generation offspring of this cross.

Remediation: (1) Suggest that the student review page 112 of Excursion 6-2, especially Figure 3. (2) If necessary, discuss Figure 3 with him.

WYY O3 EXC 6-2 2

Predicts the ratio of variations of two features in second-generation offspring.

The student applies the concept from the two-bit model that when two individuals that are pure strain for different variations of the same two features are crossed, the feature variations that will appear in the second-generation offspring can be estimated.

Student Action: Predicting the ratio as 9 to 3 to 3 to 1 [9 (dominant, dominant) to 3 (dominant, recessive) to 3 (recessive, dominant) and 1 (recessive, recessive)].

A: 9 (red flowers, wrinkled seeds)
3 (red flowers, smooth seeds)
3 (white flowers, wrinkled seeds)
1 (white flowers, smooth seeds)

B: 9 (tall, red flowers)
3 (tall, yellow flowers)
3 (dwarf, red flowers)
1 (dwarf, yellow flowers)

C: 9 (long wings, red eyes)
3 (long wings, brown eyes)
3 (short wings, red eyes)
1 (short wings, brown eyes)

Performance Check A: You may refer to Excursion 6-2 to help you answer this check. In sweet peas, the bit for purple flowers (P) is dominant over the bit for white flowers (p). The bit for wrinkled seeds (W) is dominant over the bit for smooth seeds (w). Suppose you had a sweet pea that was pure strain for purple flowers (PP) and for smooth seeds (ww). You crossed that plant with one that was pure strain for white flowers (pp) and for wrinkled seeds (WW). Predict the ratio of the feature variations you would find in the second-generation offspring of this cross.

Remediation: (1) Check Tables 1 and 2 on page 113. (2) Have the student explain how he arrived at the 9-to-3-to-3-to-1 ratio for Table 2 from his computations for Table 1 on page 113. (3) If the concept of ratio is a problem, have him review Excursion 2-1.

WYY 03 EXC 7-1 1

Predicts the appearance of offspring from a cross involving a blend.

The student applies the concepts that (1) in cases of incomplete masking, an individual which exhibits a blend of two variations has bits for each of the variations, and the bits are given to the offspring as any other bits are given, (2) when unlike bits appear in the offspring, the appearance is that of the blended variation, and (3) some offspring will have the same variation as the pure-strain parents and others will have a blend of the two variations.

Student Action: Predicting in the case of two parents with the blended variation (AB) that offspring will consist of blended (AB), pure (AA), and pure (BB) in a 2-to-1-to-1 ratio and in the case of a pure-strain parent (AA) and a blended parent (AB) that the offspring will consist of pure (AA) and blended (AB) in a 1-to-1 ratio.

A: 1. 2 roan, 1 red, 1 white; 2. 2 roan, 2 red
B: 1. 2 blue, 1 white, 1 black; 2. 2 blue, 2 white
C: 1. 2 orange, 1 yellow, 1 red; 2. 2 orange, 2 yellow

Performance Check A: When a white cow (WW) and a red bull (RR) are mated, the offspring are neither red nor white but a light red color called *roan* (RW). The genetic bits for color do not seem to mask each other completely. Copy the charts below. Then predict the appearance of the offspring of the two separate crosses.

Chart 1.

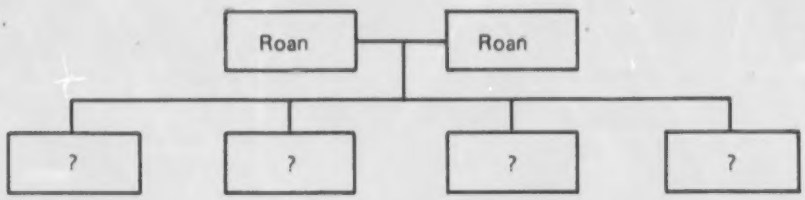
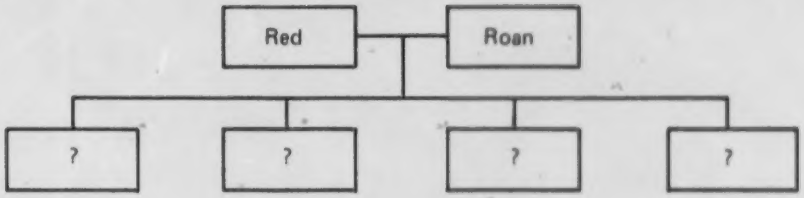


Chart 2.



Remediation: (1) Suggest that the student review page 116 of Excursion 7-1, especially Figure 3. (2) Check his response to questions 1 and 2 on page 116, and if necessary, discuss these two crosses with him. (3) Refer the student to Self-Evaluation 7-2b and c. (4) Reassess the objective with an alternate check.

Predicts possible bits for sex-related variations.

WYY
O3
EXC
7-2
1

The student applies the rules of the modified two-bit model of inheritance for sex-related feature variations.

Special Preparations: Either duplicate the chart at the back of this book for these checks or provide paper suitable for tracing the charts.

Student Action: Predicting a possible pair of bits that could be carried by each individual, in agreement with the following rules:

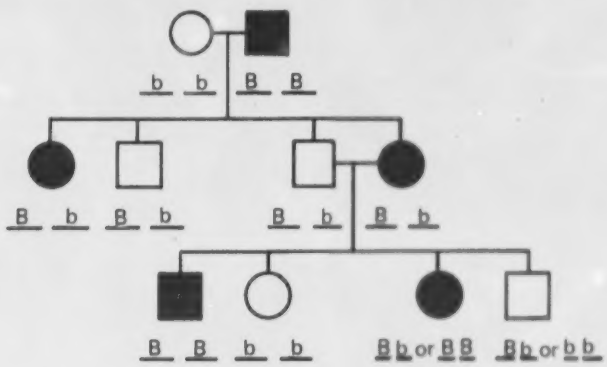
(1) an individual showing the recessive variation for his sex has two bits for this variation,

(2) an individual showing the dominant variation for his sex has either two bits for this variation or one bit for each variation, and

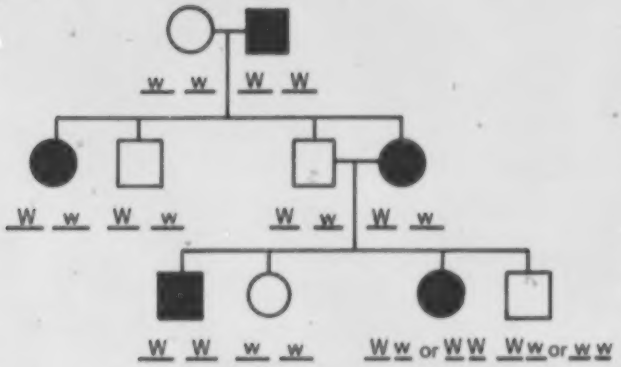
(3) if an offspring has two identical bits, each parent must have at least one of these same bits.

(The student is required to state only one possible pair of bits for each individual shown.)

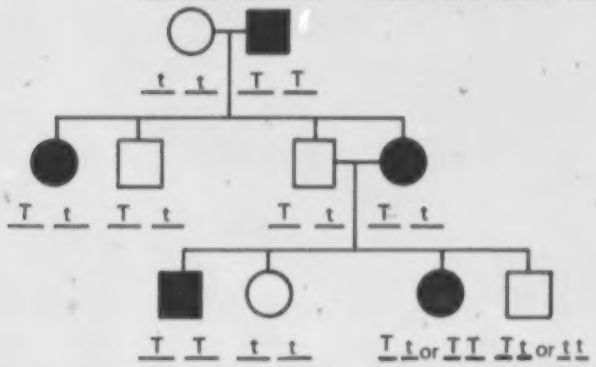
A:



B:



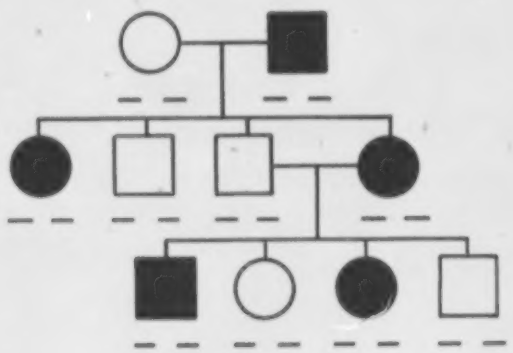
C:



Performance Check A: Get from your teacher a copy of the chart below or paper to trace it.

In some insects, inheritance of bristle length depends on the sex of the insect. In the males, short bristles are dominant over long bristles. In the females, long bristles are dominant over short bristles. Indicate on your chart a possible pair of bits carried by each of the insects. Use the letter B to represent the bit for long bristles and b for short bristles.

KEY	
■	Male with long bristles
□	Male with short bristles
●	Female with long bristles
○	Female with short bristles
– –	Places for bit symbols



Remediation: (1) Check the student's answers to questions 1 through 4 on pages 118 and 119. (2) Check his answer to question 7-2 on page 85. (3) Have him review his completion of Figure 2 on page 119. (4) Suggest that he do Excursion 7-4 for further practice in completing a chart of this type. (5) Review with him his answer to Self-Evaluation 7-3. Then have him do an alternate check and explain his answer.

WYY 03 Exc 7-3 1

States whether a husband can blame his wife for the sex of their children.

The student applies the concept that the genetic information passed from the father to the offspring determines the sex of the offspring.

Student Action: Stating that the reasoning is illogical and the notion of the concept that the genetic information passed from the father to the offspring determines the sex of the offspring.

Performance Check A: King Henry VIII divorced several wives because they bore him only daughters. He wanted a son to be the next ruler.

1. Was his reasoning logical when he blamed his wives for producing only daughters?
2. Explain your answer.

Remediation: (1) Have the student review page 122 of Excursion 7-3, especially Figure 7-3, which illustrates the fact that the male parent determines the sex of the offspring. (2) It may be beneficial to discuss this concept with him.

WYY 03 Exc 7-4 1

Predicts the appearance of and the bits carried by offspring for sex-linked features.

The student applies the following concepts of the two-bit model of inheritance as it is modified to explain sex-linked inheritance:

(1) males have an X chromosome and a Y chromosome, whereas females have two X chromosomes,

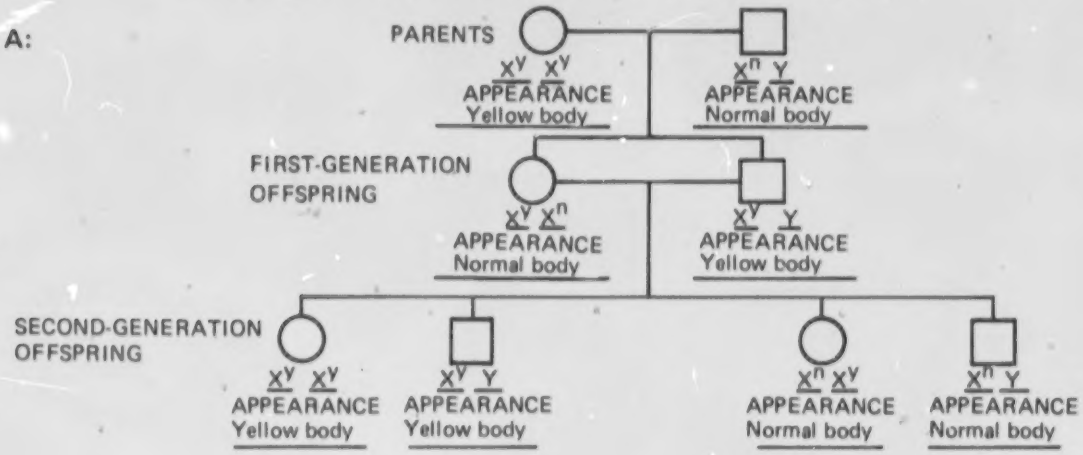
(2) bits that carry genetic information are located on chromosomes, and

(3) either the dominant or the recessive bit is expressed in males if the bit is located on the X chromosome and the Y chromosome carries no information for this feature.

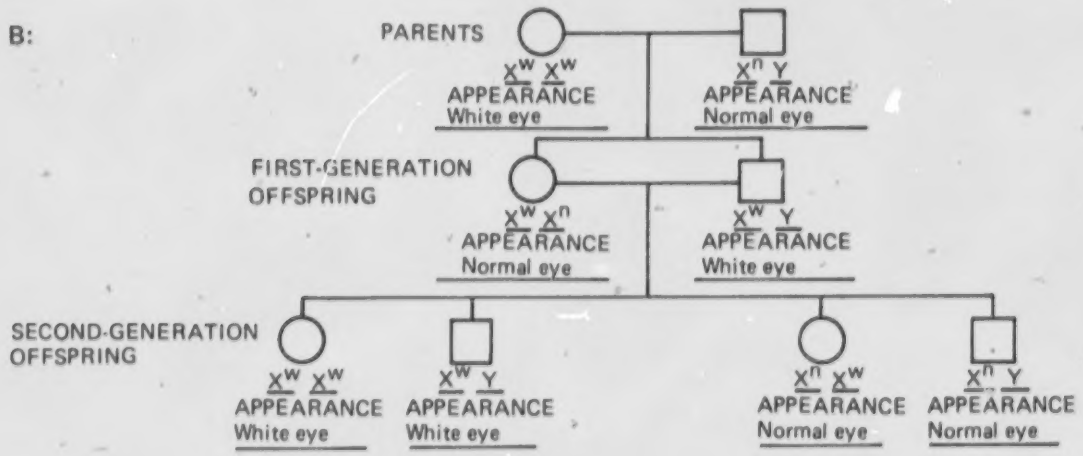
Special Preparations: Make copies of the chart labeled WYY-03-Exc 7-4-1 that appears in the special section at the back of this book.

Student Action: Predicting the appearance of and the bits for a sex-linked feature that will be carried by the first- and second-generation offspring.

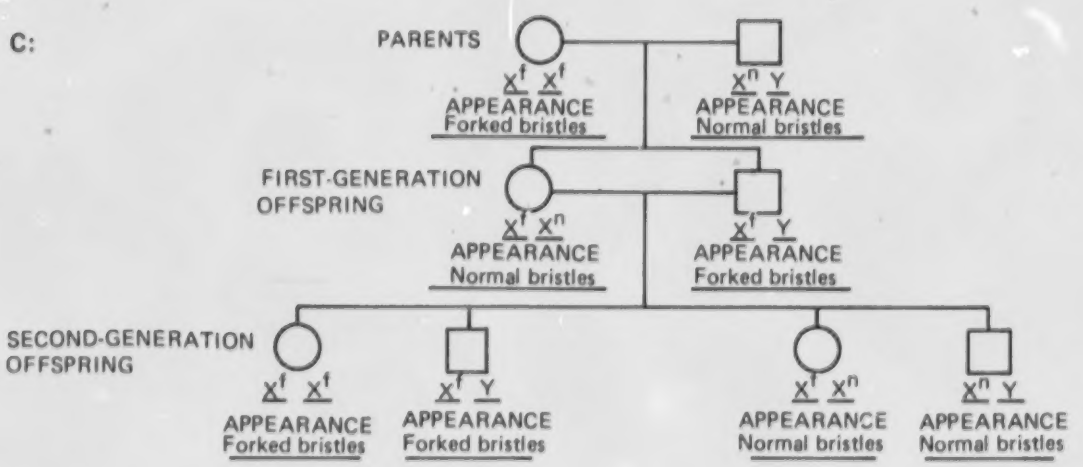
A:



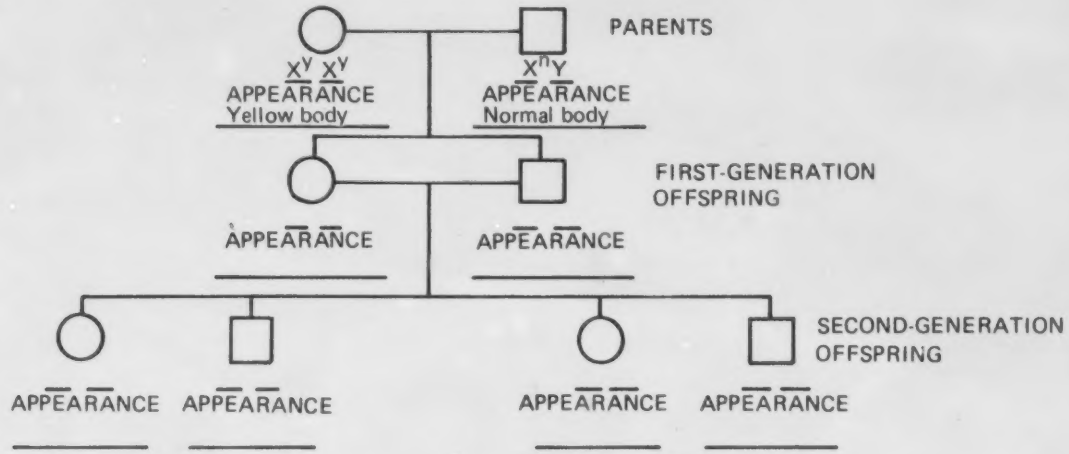
B:



C:



Performance Check A: Get a copy of the chart labeled WYY-03-Exc 7-4-1 from your teacher. You may use Excursion 7-4 to help you answer this check. In fruit flies, the X chromosome carries the bit for the recessive variation yellow body color (X^y). The Y chromosome carries no information for this feature. The appearance of and bits for the parents are given in the chart below. You are to predict the appearance of and the bits (X^y, X^n, and Y) that will be carried by the first- and second-generation offspring of the cross by filling in the blanks on your copy of the chart. Remember that X^n represents the normal trait.



Remediation: (1) If the student has difficulty completing a chart for sex-linked inheritance, suggest that he review Excursions 7-3 and 7-4, especially Figure 2, page 125, which illustrates a similar cross. The summary on page 125 will be particularly helpful. (2) Check his responses to questions 5 through 10. (3) Have him redo the check, using his book. (4) Reassess the objective with an alternate check.

States the cause of differences that develop in genetically identical living things.

WYY 03 EXC 7-5 1

The student applies the concept that environmental variables can cause differences in the appearance of genetically identical living things.

Student Action: Stating, in effect, that environment variables can affect the appearance of genetically identical individuals or listing specific environmental variables of the situation presented.

Performance Check A: Larry and Harry are identical twins. Like all identical twins, they inherited exactly the same genetic material from their parents. But Larry and Harry do not look exactly alike as adults. Explain what might cause these differences.

Remediation: (1) Question the student as to the outcome of the experiment in Excursion 7-5. Why were the color of the leaves on the tobacco plants different? (2) Check his response to key question 6 for Excursion 7-5.

WYY
O3
EXC
7-6
1

Predicts the effects of animals' coloration on population size.

The student applies the concept of protective coloration.

Student Action: Responding affirmatively and, in effect, that the animals that have protective coloration will be more abundant because there is a survival advantage if an animal's color matches that of the environment.

Performance Check A: Suppose you released one hundred green lizards and one hundred black lizards on a certain rocky island a year ago. There is not much vegetation on the island because it is mostly new, black volcanic rock. Once in a while the island is visited by birds which eat lizards.

1. Would you predict that there are more of one kind of lizard than the other living on the island now?
2. Explain your answer.

Remediation: (1) Check the student's answer to question 5 of Excursion 7-6 on page 131. (2) Have him review Activity 2 of Excursion 7-6 on page 130. (3) If he does not understand the concept of protective coloration, discuss the picture on page 131. Examples might be drawn from other books as well.

WYY
O3
EXC
7-7
1

States whether features developed because of environmental factors will be observed in offspring.

The student applies the concept that features developed because of environmental factors are not transmitted to the offspring through bits of genetic information.

Student Action: Responding negatively and, in effect, that the offspring will not have the same appearance because the factor is not transmitted by bits of genetic information.

Performance Check A: The people in a certain tribe in East Africa think it is beautiful to have very long earlobes. To make their earlobes longer, they hang weights on their earlobes to stretch them. Suppose they did this for hundreds of years.

1. Do you think their children would be born with bits of information for longer earlobes?
2. Explain your answer.

Remediation: Have the student review his responses to questions 6 through 10 on page 134 of Excursion 7-7. To answer these questions, the student was advised to study further. This objective is based on this study in which he used supplementary materials.

Investigating Variation IV

IV 01

Chapters 1 and 2

Excursions 1-1 thru 2-2

Performance Check

Summary Table

Objective Number	Objective Description
IV-01-Core-1	Recognizes an operational definition
IV-01-Core-2	States the two questions that an operational definition answers
IV-01-Core-3	Reacts to a generalization about a group of people
IV-01-Core-4	Explains why scientists look for patterns in the changes they see
IV-01-Core-5	States an operational definition for a human characteristic
IV-01-Core-6	Selects the best way to measure a human variation
IV-01-Core-7	States the advantage of using a measuring devise rather than just the senses
IV-01-Core-8	Describes a standardized procedure for determining reaction time
IV-01-Core-9	States a description of a feature that shows continuous variation
IV-01-Core-10	Defines *either-or* features
IV-01-Core-11	Labels variables as continuous or either-or variables
IV-01-Core-12	Completes a table of grouped data
IV-01-Core-13	States why scientists arrange data in charts, tables, or graphs
IV-01-Core-14	Constructs a data table for an either-or variable
IV-01-Core-15	Constructs a table to prepare a histogram
IV-01-Core-16	Constructs a table for studying either-or variables
IV-01-Core-17	Constructs an appropriate table for collecting data
IV-01-Core-18	Cleans up the work area at the close of class

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				applies	
				Q		√				recalls	
				Q						applies	
				Q					√	generates	
				Q						generates	
				Q		√				applies	
				Q						applies	
					T				√	generates	
				Q		√				recalls	
				Q		√				recalls	
				Q		√				applies	
				Q	T	√				applies	
				Q		√				recalls	
				Q	T	√				applies	
				Q	T	√				applies	
				Q	T	√				applies	
				Q	T	√				applies	
		O		Q		√				chooses	

IV
01

Objective Number	Objective Description
IV-01-Core-19	Cooperates with lab partners
IV-01-Core-20	Returns equipment promptly to storage areas
IV-01-Core-21	Responds to text questions
IV-01-Core-22	Shows care for laboratory materials
IV-01-Exc 1-1-1	Selects the metric measurement closest to the size of an object
IV-01-Exc 1-1-2	Measures length in millimeters and centimeters
IV-01-Exc 1-1-3	States a reason for differences in the last decimal places of repeated measurements
IV-01-Exc 2-1-1	Calculates the average of measurements
IV-01-Exc 2-1-2	Rounds off numbers to the nearest whole number
IV-01-Exc 2-2-1	Uses experimental data to relate to an investigated variable

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
		O		Q		√				chooses	
		O		Q		√				chooses	
		O		Q		√				chooses	
		O		Q		√				chooses	
				Q						applies	
				Q		√				applies	
				Q					√	applies	
				Q		√				applies	
				Q		√				applies	
				Q				√	√	applies	

IV 01 Core 1

Recognizes an operational definition.

The student applies the concept that an operational definition has two parts, one telling how to determine whether the variation is present or not and the other telling how to measure the amount of the variation present.

Student Action: Selecting the definition which states a way to detect and a way to measure the term being defined and stating the essence of the concept.

A, B, and **C:** Definition b

Performance Check A: Below are two definitions of ways in which people differ. Study these definitions, and answer the two questions that follow.

Definition a: A person's *treasure-finding index* is his ability to find valuable objects which have been buried.
Definition b: A student's *sprint index* is a measure of how rapidly he can run for short distances. It is measured by timing how long it takes the student to run 100 meters on a cinder track.

1. Which of the above is an operational definition?
2. Explain the reason for your answer.

Remediation: (1) Have the student read the second, third, and fourth paragraphs on page 6. (2) Review the student's answers to questions 1-4 and 1-5 on page 7. (3) Review his answers to Self-Evaluations 1-1 and 1-2.

IV 01 Core 2

States the two questions that an operational definition answers.

The student recalls the two questions that an operational definition should answer about the entity being defined.

Student Action: Stating the essence of the two questions, "How can I tell when I have some?" and "How can I tell how much I have?"

Performance Check A: Whenever possible, an operational definition should answer two questions. What are the questions that it should answer?

Remediation: (1) Have the student review pages 6 and 7. (2) Check his answer to Self-Evaluation 1-1. (3) If a copy of *Why You're You* from the ISCS Level III materials is readily available, have the student do its Excursion 1-2 on page 91.

IV 01

Reacts to a generalization about a group of people.

The student applies the concept that people grouped on the basis of one variable show great variation in other variable..

Student Action: Responding negatively and, in effect, that the statement cannot possibly be true because of the great variation among people.

Core 3

Performance Check A: Perhaps you have heard people make statements such as "All students with long hair are just alike."

1. Can a statement like this ever be true?
2. Explain the reasons for your answer.

Remediation: (1) Have the student review page 1. (2) Check his answer to question 1-1 on page 1. (3) Ask him if his data in Chapters 1 and 2 would support the statement "All ninth graders in section _____ at _____ Junior High School are alike" and to explain his answer. Point out that individuals were placed in that section based on several variables – age, the number of grades they had completed, residence in a given area, membership in a certain program – so they are more alike than thirty people picked at random would be. Have him explain his answer in the light of this increased number of points of similarity.

Explains why scientists look for patterns in the changes they see.

IV 01 Core 4

The student generates a reason for the pattern-seeking nature of scientific investigation.

Student Action: Stating, in effect, that eventually this pattern-seeking nature allows scientists to predict what changes may occur and may even be an aid in developing an explanation for why they occur.

Performance Check A: Scientists spend a great deal of time looking for patterns in the way things change. Why?

Remediation: (1) Have the student read the paragraph immediately below question 1-1 on page 1. (2) Have him read the second, third, and fourth paragraphs on page 2. (3) If he still does not grasp the notion, ask him why scientists would be interested in learning whether a pattern exists in weather changes.

States an operational definition for a human characteristic.

IV 01

The student generates an operational definition for a given human characteristic that shows variation.

Core 5

Student Action: Stating a definition that includes the notions of a method for determining whether the characteristic is present and a method for measuring how much is present.

A: The notion of the following: *Vision* can be detected by having a person read an eye chart and measured by determining the smallest letters on an eye chart that the person can read correctly.

B: The notion of the following: *Jogging index* can be detected by having a student jog and measured by counting the number of times a student is able to jog around the school's track.

C: The notion of the following: *Strength index* can be detected by having an athlete lift a barbell above his head and measured by counting the number of times he can lift it.

Performance Check A: People differ in their ability to see different sized letters on an eye chart from several feet away. The ability to see is called *vision.* Write an operational definition of *vision.*

Remediation: (1) Check the student's answers to Self-Evaluations 1-1 and 1-2. (2) Check his answers to questions 1-4 and 1-5 on page 7. (3) Have him read the two paragraphs following question 1-5 on page 7. (4) If operationally defining is a problem for the student and if the ISCS text *Why You're You* is available, have the student do Excursion 1-2 of that text. (5) If ISCS Level I materials are available, refer him to page 11 of that text for an introduction to operational definitions. This Remediation will treat the problem at an introductory level.

IV 01 Core 6

Selects the best way to measure a human variation.

The student applies the concept that the best way to measure a human variation is to use an objective testing method in a standard way.

Student Action: Selecting the option which includes an objective testing method used in a standard way.

A: c
B: e
C: b

Performance Check A: Suppose you wanted to compare the ability of different students in your class to play the guitar. From the choices below, select the best way of measuring guitar-playing ability.

a. Ask each person how well he can play the guitar.
b. Ask each person how many guitar lessons he has had.
c. Ask each person to play the same unfamiliar songs, and count the number of mistakes each makes.
d. Ask each person to play the guitar, and judge how well each does.
e. Ask a student who knows all of the guitar players well to tell you who is the best player.

Remediation: (1) Refer the student to the method employed in Activity 1-1 on page 3. (2) Refer him to the method employed in Activities 1-4 through 1-6, page 10.

IV 01 Core 7

States the advantage of using a measuring device rather than just the senses.

The student applies the concept of the variability of human senses when they are used to make a comparison.

Student Action: Stating the essence of the idea that because human senses can be fooled by the appearance of things, a measuring device should be used so that comparisons are made on the basis of an objective standard or quantity.

Performance Check A: When scientists want to compare different things, they usually try to use an appropriate measuring device, such as a ruler or a test. State a reason why it is important to use a measuring device when one is available rather than just relying on your own senses.

Remediation: (1) Check the student's answers to questions 1-6 and 1-7 on pages 7 and 8. (2) Have him read the section entitled "Measuring Illusions" on page 9. (3) Ask him why it is necessary to use the measuring device at the bottom of page 10. (4) If a student should focus his answer on the adaptability of the sense organs, such as that of the eye to variations of light intensity, discuss illusions with him as an alternate reason to avoid relying on the senses.

IV 01 Core 8

Describes a standardized procedure for determining reaction time.

The student generates an activity to test whether a person's reaction time, as measured by the dropping-stick method, is affected by which point of the stick he watches.

Student Action: Designing an activity to test the hypothesis above, which includes the notion of measuring several students' reaction times, using a standardized procedure that includes measuring the reaction times for each student both when he watches the release point and when he watches the catch point and in which all other variables are kept constant.

Performance Check A: Dina was measuring reaction time, using the dropping-meterstick method. She found that Jack had a much shorter reaction time than anyone else. She also noticed that Jack watched her hand release the meterstick. All the other students had watched their own fingers with which they caught the meterstick. Dina concluded that a student's reaction time, as measured by the dropping-meterstick method, is shorter when the student watches the release of the meterstick than when he watches the catch point. Describe an activity which you could perform to test this idea.

Remediation: (1) Ask the student how he might adapt Activities 2-5 and 2-6, page 18, to include both ideas to be tested in the question. (2) Refer him to Table 2-3 and the following paragraphs on pages 19 and 20 for some help in organizing the data.

IV 01 Core 9

States a description of a feature that shows continuous variation.

The student recalls the description of a feature that shows continuous variation.

Student Action: Responding, in effect, that a continuous variation is a feature that varies through all the different values between the extreme variations.

Performance Check A: What does a scientist mean when he says that a feature shows continuous variation?

Remediation: (1) Check the student's answer to Self-Evaluations 2-2 and 2-4. (2) Refer him to the first paragraph on page 21. (3) Review his answers to questions 3-1 through 3-3 with him, and have him make and explain any needed correction.

IV 01 Core 10

Defines *either-or* features.

The student recalls the definition of *either-or* features.

Student Action: Responding to the effect that a feature which shows either-or variation has only two possible variations.

Performance Check A: What do we mean when we say that a feature shows an *either-or* variation?

Remediation: (1) Refer the student to paragraph 1 on page 21. (2) Check the student's answers to Self-Evaluations 2-2a and 2-4.

IV 01 Core 11

Labels variables as continuous or either-or variables.

The student applies the rule that a variable is considered to be an either-or variable if it can have one of only two possible values and it is considered to be a continuous variable if it can have any value in a range of values.

Student Action: Indicating at least four of the five variables correctly as continuous or either-or variables.

A: 1. Either-or, 2. Continuous, 3. Continuous, 4. Either-or, 5. Continuous

B: 1. Either-or, 2. Continuous, 3. Continuous, 4. Continuous, 5. Either-or

C: 1. Continuous, 2. Either-or, 3. Continuous, 4. Either-or, 5. Continuous

Performance Check A: Identify each of the variables below either as a continuous variable or as an either-or variable.

1. Whether a student has ever seen the ocean
2. How fast a secretary can type
3. The length of a boy's hair
4. If a man is a policeman or not
5. A person's age

Remediation: (1) Check the student's answers to Self-Evaluations 2-2 and 2-4. (2) Refer him to the first paragraph and questions 2-7 and 2-8 on page 21. (3) Review with him his answers to questions 3-1 through 3-3 on page 25 and have him make and explain any needed changes.

Completes a table of grouped data.

IV 01 Core 12

The student applies the procedure for completing a table of grouped data.

Student Action: Completing the table by entering a mark in the tally column in the appropriate data group for each datum, counting the marks for each group to get a group total, and entering each group total in the space provided for that data group in the total column so that not more than two of the totals are more than two units in error.

A, B, and **C:**

COLUMN TITLE	TALLY	TOTAL
139-146	𝍸	3
147-154	𝍸	5
155-162	𝍸	3
163-170	𝍸	4
171-178	𝍸	2
179-186	𝍸	1

Performance Check A: Fred measured the heights of the students in his class. His measurements in cm are shown below.

Fred – 162	Hank – 180	Mary – 173
Henry – 170	Bruce – 152	Louise – 162
Charles – 143	Wendy – 162	Jim – 178
Isabel – 150	Greg – 167	Stephanie – 167
Sally – 147	Brian – 153	Wayne – 165
Betty – 140	Nadine – 153	Janice – 140

Draw a table similar to the one shown below, and use Fred's measurements to complete the table.

HEIGHT (in cm)	TALLY	TOTAL
139-146		
147-154		
155-162		
163-170		
171-178		
179-186		

Remediation: (1) Refer the student to the two paragraphs following Table 2-2 and to Table 2-3, page 19. (2) Review the student's answers to Self-Evaluation 2-5, parts a and b.

IV 01 Core 13

States why scientists arrange data in charts, tables, or graphs.

The student recalls the reasons that scientists usually arrange their data in charts, tables, or graphs.

Student Action: Stating the effect of two of the following three reasons: (1) this arrangement presents the data in an ordered rather than a random form, (2) it makes the data easier to analyze, and (3) it makes it easier to see the relationships between the variables.

Performance Check A: State two reasons that scientists usually arrange their data in charts, tables, or graphs.

Remediation: (1) Refer the student to the paragraphs following question 2-13 on page 23. (2) Check his answer to Self-Evaluation 2-3. If necessary, have him review the accepted response. (3) If the student has not done Excursion 2-2, he might profit from it. (4) Give him a jumbled group of numbers which vary by a constant amount and ask him to state quickly any relationship he sees. Then have him order the numbers from the least to the greatest. Have him find several examples of charts that are arranged so that the variation being recorded is in a fixed order, as in Table 2-3.

IV 01 Core 14

Constructs a data table for an either-or variable.

The student applies the rule for tabulating and analyzing measurements of an either-or variable.

Student Action: Constructing and labeling a table with two data rows (or columns), with each row (or column) labeled with the feature variation which applies to it.

A, B, and **C:** Possible table formats are given below.

	TALLY COLUMN	TOTAL
EITHER		
OR		

STUDENT	EITHER	OR
John		
Henry		
Mary		
Helen		
TOTAL		

Performance Check A: Charles wanted to determine how many students in his class had driver's licenses and how many did not. Construct a table for collecting and analyzing his measurements.

Remediation: (1) Refer the student to Figure 2-2 on page 21. (2) Check his answer to Self-Evaluation 2-5a. (3) Refer him to Excursion 2-2 on page 67.

IV 01 Core 15

Constructs a table to prepare a histogram.

The student applies the rules for tabulating measurements of a continuous variable.

Student Action: Constructing and labeling a table with more than two rows, in which each row is labeled with the range of measurements that fall into that data group, such that each datum falls into one and only one data group.

Performance Check A: Heather wanted to measure the number of words a person can read in one minute. She had all her classmates begin reading the same story at the same time. After they had read for one minute, she told them to stop. Her data are shown in the table below. Construct another table of all her reading speed measurements from which Heather will be able to construct a histogram. (Note: You need only to construct the table, not to enter the data in the table.)

STUDENT	NUMBER OF WORDS READ	STUDENT	NUMBER OF WORDS READ
Jack	170	Jake	320
Judy	120	John	310
Jason	250	Janet	140
Jody	270	Jean	190
Jill	128	Jerry	190
Joan	195	Joy	210
Jan	84	Jane	200
Joe	62	Jim	240

Remediation: (1) Refer the student to Table 2-3 on page 19. (2) Check his answers to questions 2-3 and 2-4 on page 20.

IV 01 Core 16

Constructs a table for studying either-or variables.

The student applies the rule that a contingency table is the most appropriate table for collecting measurements of and analyzing the relationship between either-or variables.

Student Action: Constructing and labeling a table with the rows representing the two possible values of one variable and the columns representing the two possible values of the other variable.

A, B, and **C:**

		VARIABLE ONE		
		Either	Or	Total
VARIABLE TWO	Either			
	Or			
	Total			

Performance Check A: Faye wants to determine if there is any relationship between whether a student is right-eyed or left-eyed and whether he sits on the right-hand or left-hand side of the classroom. Construct a table for collecting and analyzing measurements to find out if these variables are related.

Remediation: (1) Review the student's answer to Self-Evaluation 2-5. (2) Refer him to Table 2-4 on page 22. (3) Refer him to questions 2-12 and 2-13, page 23, and the paragraphs following. (4) If his problem is that he does not understand contingency tables, have him review Excursion 2-2 on page 67.

IV 01 Core 17

Constructs an appropriate table for collecting data.

The student applies the rule for tabulating a continuous and an either-or variable.

Student Action: Constructing and labeling a two-way table in which one dimension, either columns or rows, represents the possible values of one variable and the other dimension, either columns or rows, represents the possible values of the other variable and in which two rows or columns are labeled with the possible values of the either-or variable and more than two columns or rows are labeled with the ranges of the continuous variable that fall into that data group.

A, B, and C:

CONTINUOUS VARIABLE	VARIABLE	
	Either	Or
(more than two intervals in this column)		

Performance Check A: Joyce wants to find out whether a relationship exists between a person's having a driver's license and his grades in school. Construct a table for collecting these measurements.

Remediation: (1) Check the student's answer to Problem Break 2-3 on page 23. (2) See Remediation IV-02-Core-15. (3) See Remediation IV-02-Core-16.

IV 01 Core 18

Cleans up the work area at the close of class.

The student chooses to close the laboratory activity period promptly upon receiving notification of the time to do so.

Student Action: Ceasing the ongoing laboratory activity when notified of the time, returning materials in usable, clean condition to storage, and participating in work area cleanup, on at least three separate occasions when being observed by the teacher without his knowledge.

Teacher's Note: The opportunity for assessment of this objective arises almost every day during the course of regularly assigned laboratory activities. Use a few minutes of class time for group instruction early in the school year, and almost every week for reinforcement, to discuss the role of the student in the ISCS learning environment. To encourage personal responsibility in the student, discuss the reasons for his closing his activities promptly (to allow time for himself and others for lab-closing activities), returning materials to storage in clean condition (to facilitate their use by others), and participating in area cleanups (to leave the area as clean as he found it).

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) If a student fails to accept this responsibility, approach him individually and review the reasons for his acceptance of it. Emphasize the social responsibility for cooperation in the learning environment for the good of all students. Point out that he has received the benefit of other students' provisions for others as well as for themselves. (2) Do not, at first, suggest that he may lose his privileges unless he cooperates. But if he doesn't cooperate after you observe his behavior several times, ask him if he can suggest a proper penalty. (3) An alternative remedy may be to request him to assist in the process of overall classroom accounting of the materials for a period of time until he recognizes the importance of the student's role. (4) Do not use extra cleanup as a penalty for not cleaning up properly. In other words, don't use something as a penalty that you want done willingly.

IV 01 Core 19

Cooperates with lab partners.

The student chooses to cooperate with fellow students in the laboratory.

Student Action: Being polite, waiting his turn, being orderly when moving about, and observing the right of his classmates to work without being unnecessarily disturbed, when observed without his knowledge by the teacher or another designated person on at least three occasions.

Teacher's Note: The opportunity for assessment of this objective arises almost every day during the course of regularly assigned laboratory activities. Use a few minutes of class time at the beginning of a session for a whole-group discussion early in the school year and several times later on to discuss the need for cooperation with and consideration of other students. Some particular points for discussion include being polite, waiting patiently, not making others wait longer than necessary, being orderly when moving about, and observing the right of others not to be disturbed. Talk about each student's accepting the personal responsibility for his own behavior in the group situation.

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) If a student fails to accept any of these responsibilities, approach him privately and review the reasons for his lack of cooperation with his fellow students. Suggest that he pay some attention to changing his behavior to more acceptable standards. (2) Find out if the student feels that he is behaving in a less than acceptable way. If so, ask him whether he feels some penalty should be imposed and what he thinks a suitable penalty would be.

IV 01

Returns equipment promptly to storage areas.

The student chooses to show personal responsibility for returning laboratory equipment promptly to the proper storage places as soon as it is no longer needed, during the class period, and not just at the end of the period.

Core 20

Student Action: Returning equipment and materials no longer needed to the proper storage places on at least three occasions when observed by the teacher or another designated observer without his knowledge of being checked.

Teacher's Note: This objective may be assessed at any time the student is responsible for learning activities requiring the use of equipment and supplies. Use a few minutes of class time for group discussion of the reasons for returning equipment to storage areas promptly when it is not being used by the student or by his group. The reasons include (1) the short supply of certain items and the need to cooperate with others, (2) the chances of equipment's being misplaced, (3) the possibility of accidental damage to equipment, and (4) the greater opportunity for pilferage by an irresponsible student when things are disorganized.

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: In a private conference, discuss the reasons for the student's cooperation in this request. Ask for that cooperation. See also Remediations (1), (2), and (3) for IV-01-Core-18.

IV 01 Core 21

Responds to text questions.

The student chooses to write in his *Record Book* the answers to 90% or more of the textbook questions.

Student Action: Exhibiting the written responses when requested to do so. At least nine out of ten questions should have responses, be they correct or incorrect.

Teacher's Note: It is intended that this objective be assessed throughout the year. Such a check provides opportunities to encourage students to work nearer their capacities while remaining independent of the teacher. Use a few minutes of class time for a group discussion of the reasons for writing the answers in the *Record Book*. Writing in the *Record Book* serves (1) to help the student think through what he sees and does, (2) to preserve ideas for future reference, (3) to make a record of the student's progress through the core, (4) to provide the teacher with a source of input for analyzing the student's difficulties and progress, and (5) to help the student learn the background ideas for conceptual understanding. Writing in the *Record Book* is "in"; writing in the text is "out."

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) In a private conference, discuss with the student the ideas enumerated and ask why he chooses not to write the answers. (Perhaps he cannot write!) Evaluate his reasons and counsel him accordingly. Encourage him to follow the pattern of his classmates and set down his ideas as they are doing. (2) Have him read "Notes to the Student," pages viii and ix in his text. (3) Follow up in a few days to determine his actions.

IV 01 Core 22

Shows care for laboratory materials.

The student chooses to show proper care and use of ISCS laboratory materials.

Student Action: Using the materials only for their intended purpose or requesting permission to do other specific experiments with them when being observed without his knowledge by the teacher or another designated person on three or more occasions.

Teacher's Note: This objective may be assessed at any time that the student is responsible for a learning activity in which equipment and supplies are required. Use a few minutes of class time for a whole-group discussion of the reasons for handling laboratory materials properly. Such reasons include: (1) If damaged, they are lost to use by students who need them now. Short supply means waiting in line. (2) They cannot readily be replaced. Replacement usually takes several months at best. (3) If materials are handled properly, they may be used for other than regular activities (with the permission of the teacher and after making a proper request).

Performance Check A: Your teacher will observe you for this check when he can.

Remediation: (1) In a private conference, ask the student why he chooses to mishandle equipment. Help him to evaluate his reasons, and ask for his cooperation in the future. If he agrees, reassess the objective later. (2) If after the conference he still does not agree, ask him if he feels that he should be penalized and what he thinks should be an appropriate penalty. Give him another opportunity for compliance. (3) If he is still uncooperative, apply a penalty for mishandling equipment. This may mean denying him use of the equipment either temporarily or permanently or taking some other suitable action.

IV 01 Exc 1-1 1

Selects the metric measurement closest to the size of an object.

The student applies the relationships that a meter is slightly longer than a yard, a centimeter is about half an inch long, and a millimeter is about 1/25th of an inch long.

Student Action: Selecting the appropriate measurements.

A: 1. b, 2. d
B: 1. a, 2. f
C: 1. b, 2. b

Performance Check A:

1. Suppose you measured the length of the school's football field (100 yards) in metric units. Which of the measurements given below would be closest to your measurement?

a. 9.1 cm	d. 9.1 m
b. 91 m	e. 91 cm
c. 91 mm	f. 910 m

2. Suppose you measured the thickness of your ISCS textbook in metric units. Which of the measurements given below would be closest to your measurement?

a. 70 mm	d. 7 mm
b. 7 m	e. 0.7 mm
c. 700 m	f. 7 cm

Remediation: (1) Review the student's answer to question 8 on page 61 of Excursion 1-1. (2) Review his answer to Self-Evaluation 1-3.

Measures length in millimeters and centimeters.

IV 01 Exc 1-1 2

The student applies the concepts that the number of small scale divisions between two points is the distance between these points in mm and that 10 mm make up 1 cm.

Student Action: Stating the distance correctly to within ±1 mm (0.1 cm)

A: 1. 25 ±1 mm, 2. 5.9 ±1 cm
B: 1. 2.5 ±.1 cm, 2. 59 ±1 mm
C: 1. 8.4 ±.1 cm, 2. 59 ±1 mm

Performance Check A:

1. What is the distance between A and B in millimeters?
2. What is the distance between B and C in centimeters?

Remediation: (1) Check the student's answers to questions 4, 5, and 8 on pages 60 and 61. (2) Check his answers to the Checkup on page 62. (3) Check his answer to Self-Evaluation 1-3.

States a reason for differences in the last decimal places of repeated measurements.

IV

The student applies the concept that when the last digit of a measurement is estimated, the last digit will vary.

O1 Exc 1-1 3

Student Action: Stating that probably the last digit was estimated and the notion that estimated digits will vary.

Performance Check A: Art measured the width of a board as 20.45 cm. Peggy measured the same board with the same measuring device and reported it to be 20.42 cm wide. What is the most likely reason for the difference in their measurements?

Remediation: (1) Review the student's answer to question 6, page 61, of Excursion 1-1. (2) Have him read the paragraph following question 6 on page 61.

IV O1 Exc 2-1 1

Calculates the average of measurements.

The student applies the rule that an average of a group of numbers may be found by adding together all the numbers and dividing their sum by the number of numbers.

Student Action: Calculating the average to within ±0.1 cm.

A: 6.2 ±0.1 cm
B: 5.4 ±0.1 cm
C: 4.8 ±0.1 cm

Performance Check A: Calculate the average of the following measurements to one decimal place.

2.6 cm
4.9 cm
9.2 cm
8.1 cm

Remediation: (1) Refer the student to page 64 of Excursion 2-1. (2) Review his answers to questions 3 and 4 on page 64 of Excursion 2-1. (3) Review his answer to Self-Evaluation 2-1. (4) Have him do an alternate check.

IV O1 Exc 2-1

Rounds off numbers to the nearest whole number.

The student applies the rules that if the digit to be dropped is 5 or greater, the digit is dropped and 1 is added to the digit to the left of it and if the digit to be dropped is less than 5, the digit is dropped and the digit to the left of it remains the same.

Student Action: Converting the decimal numbers to whole numbers correctly.

A: 1. 114, 2. 865, 3. 292, 4. 360, 5. 526
B: 1. 241, 2. 647, 3. 919, 4. 596, 5. 627
C: 1. 114, 2. 649, 3. 199, 4. 956, 5. 276

Performance Check A: Round off the following measurements to the nearest whole number.

1. 114.2 cm
2. 864.6 cm
3. 291.9 cm
4. 359.5 cm
5. 526.0 cm

Remediation: (1) Refer the student to rules 1 and 2 on page 65. (2) Review with him his answers in Table 4 on page 66. (3) Have him do an alternate check.

2

Uses experimental data to relate to an investigated variable.

IV O1 Exc 2-2 1

The student applies the concept that experimental data can be used to evaluate statements only when the statements relate to the investigated variables.

Student Action: Stating that the data can be used to judge the correctness of the one statement that refers directly to the measured variables and cannot be used to judge the correctness of the other statement and the effect of the concept.

A, B, and **C:** 1. Yes, 3. No

Performance Check A: Sally measured the handedness of each of her classmates. She separated the results for the boys and girls. Her data are shown below.

		HANDEDNESS		
		LH	RH	Totals
SEX	Boys	4	10	14
	Girls	3	12	15
	Totals	7	22	29

Suppose someone made the statement that girls are more likely to be left-handed than boys.

1. Could you use Sally's data to tell if the statement is correct?
2. Explain your answer.

Suppose someone else said that boys are more likely to be right-eyed than girls.

3. Could you use Sally's data to tell if this statement is correct?
4. Explain your answer.

Remediation: (1) Review the student's answer to question 6 on page 69 of Excursion 2-2. (2) Review his answer to question 7 on page 69. (3) If he has difficulty answering part 2, have him read the paragraph following question 7 on page 69, and review with him his answer to question 8.

IV
O2

Chapters 3 thru 5

Excursions 3-1 thru 5-1

Performance Check

Summary Table

Objective Number	Objective Description
IV-02-Core-1	Indicates variables as continuous or either-or
IV-02-Core-2	Defines the term *range* operationally in a statistical context
IV-02-Core-3	Calculates the range of a set of measurements
IV-02-Core-4	Defines operationally the *mean* of a set of measurements
IV-02-Core-5	Calculates the mean of a set of measurements
IV-02-Core-6	States the definition of *mode*
IV-02-Core-7	Selects the mode from measurements
IV-02-Core-8	Constructs a histogram
IV-02-Core-9	States why data are arranged in histograms or other graphs
IV-02-Core-10	Groups data in fifths
IV-02-Core-11	Explains why experiments are often repeated many times
IV-02-Core-12	States a reason for repeating measurements and averaging them
IV-02-Core-13	Calculates the mean and compares a value to it
IV-02-Core-14	States why the mean may not appear in the values of the sample
IV-02-Core-15	Explains what is meant by an average (normal) person
IV-02-Core-16	States the information needed to draw conclusions from a single measurement
IV-02-Core-17	Judges the necessity of closed eyes during hearing- and touch-sensitivity tests
IV-02-Core-18	Calculates the mean error

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		√				classifies	
				Q		√				recalls	
				Q		√				applies	
				Q		√				recalls	
				Q	T	√				applies	
				Q		√				recalls	
				Q	T	√				applies	
			P	Q	T	√				applies	
				Q		√				recalls	
				Q	T					applies	
				Q		√				recalls	
				Q		√				recalls	
				Q	T	√				applies	
				Q					√	applies	
				Q		√				applies	
				Q						applies	
				Q						applies	
				Q	T		√		√	applies	

IV
02

Objective Number	Objective Description
IV-02-Core-19	States the usefulness of a mean error calculation
IV-02-Core-20	Calculates the mode error
IV-02-Core-21	States why researchers are concerned with similarities
IV-02-Core-22	States whether the characteristics of an individual are obtainable from group data
IV-02-Exc 3-1-2	Selects and names the proper points used to convert a histogram to a line graph
IV-02-Exc 4-1-1	Measures angles
IV-02-Exc 4-1-2	Constructs angles with a protractor
IV-02-Exc 4-2-1	States the advantages of different eye locations for different animals
IV-02-Exc 4-3-1	States why particular fingerprints didn't match standard sets
IV-02-Exc 5-1-1	Explains why sampling techniques are used to measure group characterisitcs
IV-02-Exc 5-1-2	Selects a graph of a normal curve
IV-02-Exc 5-1-3	Selects the typical curve for continuously varying human traits
IV-02-Exc 5-1-4	Defines *random sample*
IV-02-Exc 5-1-5	States why a random sample is desirable
IV-02-Exc 5-1-6	Recognizes whether a sample is random or not
IV-01-Core-2R	States the two questions that an operational definition answers
IV-01-Core-6R	Selects the best way to measure a human variation
IV-01-Core-9R	States a description of a feature that shows continuous variation

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q					√	generates	
				Q	T		√		√	generates	
				Q					√	recalls	
				Q		√				applies	
				Q						applies	
	M			Q						manipulates	
	M			Q						manipulates	
				Q						applies	
				Q						applies	
				Q						generates	
				Q						identifies	
				Q						applies	
				Q		√				recalls	
				Q		√				recalls	
				Q						applies	
				Q		√				recalls	
				Q		√				applies	
				Q		√				recalls	

IV
O2

Objective Number	Objective Description
IV-01-Core-10R	Defines *either-or* features
IV-01-Core-11R	Labels variables as continuous or either-or variables
IV-01-Core-17R	Constructs an appropriate table for collecting data
IV-01-Exc 1-1-2R	Measures length in millimeters and centimeters
IV-01-Exc 2-1-1R	Calculates the average of measurements
IV-01-Exc 2-1-2R	Rounds off numbers to the nearest whole number

	Materials	Observer	Special Preparations	Quick Score	3 + Minutes	Basal	Math	Reading	Concept	Action Verbs	Notes
				Q		✓				recalls	
				Q		✓				applies	
				Q	T	✓				applies	
				Q		✓				applies	
				Q		✓				applies	
				Q		✓				applies	

IV O2 Core 1

Indicates variables as continuous or either-or.

The student classifies a pair of words as representing a continuous or an either-or variable.

Student Action: Indicating the variable as an either-or variable if only two values of the variable are possible and as a continuous variable if many different values are possible.

A: 1. continuous, 2. either-or, 3. continuous, 4. continuous
B: 1. continuous, 2. either-or, 3. either-or, 4. continuous
C: 1. either-or, 2. continuous, 3. either-or, 4. either-or

Performance Check A: State whether each of the pairs of words below represents a continuous or an either-or variable.

1. Tall or short
2. Alive or dead
3. Dark or light
4. Skinny or fat

Remediation: (1) Check the student's answers to questions 3-1 through 3-3 on page 25. (2) Check his answers to Self-Evaluations 2-2 and 2-4. (3) If he is unable to answer the questions in (1), refer him to the top of page 21. (4) Ask him to list two examples of each kind of variable.

IV O2 Core 2

Defines the term *range* operationally in a statistical context.

The student recalls an operational definition for the term *range* used in a statistical context.

Student Action: Stating the effect of the definition that the range of a set of measurements is the difference between the largest measurement and the smallest measurement.

Performance Check A: Will's data have a very wide range. What is an operational definition for the term *range* as it is used in that sentence?

Remediation: (1) Refer the student to the second and third paragraphs on page 28. (2) Check his answer to question 3-7 on page 28. (3) If he has difficulty with operational definitions and a Level I textbook is available, have the student review page 11 of Chapter 2.

IV

Calculates the range of a set of measurements.

The student applies the definition of the range of a set of values.

Student Action: Reporting the range as the difference between the largest value and the smallest value.

A: 21
B: 55
C: 26

IV O2 Core 3

Performance Check A: Bill measured the number of push-ups the boys in his class could do. His data are shown below.

STUDENT	NUMBER OF PUSH-UPS	STUDENT	NUMBER OF PUSH-UPS
Fred	6	Oscar	15
Charlie	2	Tom	7
Doug	12	Roger	4
Henry	3	Jim	23
Tim	9	Carl	18

What is the range of his measurements?

Remediation: (1) Check the student's answer to Self-Evaluation 3-2b. (2) Check his answer to question 3-6 on page 28. (3) Have him read the second and third paragraphs on page 28. (4) Have him check the Remediation for IV-02-Core-2 where the operational definition of *range* is discussed. (5) Have him do an alternate check.

Defines operationally the *mean* of a set of measurements.

IV O2 Core 4

The student recalls the operational definition of the *mean* of a set of measurements.

Student Action: Stating the effect of the definition that the mean of a set of numbers is the sum of all the numbers divided by the number of numbers.

Performance Check A: Give an operational definition for the *mean* of a set of measurements.

Remediation: (1) Refer the student to the paragraphs following question 3-7 on page 28. (2) Check his answer to question 3-8, page 28, and review it with him. (3) Review his response to Self-Evaluation 3-2d with him. Have him correct his response to this check. (4) If he has difficulty understanding the meaning of *operational definition* and ISCS Level I materials are available, have him review page 11 of the Level I text.

Calculates the mean of a set of measurements.

IV

The student applies the rule for calculating the mean of a set of measurements.

O2 Core 5

Student Action: Reporting the mean correctly to the nearest whole number, as found by dividing the sum of all the measurements by the number of measurements.

A: 15 seconds
B: 15 seconds
C: 20 seconds

Performance Check A: Tom measured how long it took each of the boys in his class to run 100 meters. His data are shown below.

STUDENT	TIME (in sec)
Henry	15
Pierre	13
Roger	16
Rich	14
Chris	14
Bill	19
Fred	13
Mario	17

Calculate the mean of his measurements to the nearest whole number.

Remediation: (1) Check the student's answer to Self-Evaluation 3-2d. (2) Check his answer to question 3-8 on page 28. (3) Refer him to the paragraphs following question 3-7 on page 28. (4) Have him read page 64 from just below question 2 to the bottom of the page. (5) Have him do an alternate check.

IV O2 Core 6

States the definition of *mode*.

The student recalls the definition of the *mode* of a set of measurements.

Student Action: Stating the notion of the definition that the mode of a set of measurements is that measurement which occurs most often.

Performance Check A: What is meant by the *mode* of a set of measurements?

Remediation: (1) Refer the student to the paragraphs following question 3-9 on page 28. (2) Check his answers to questions 3-10 and 3-11 on page 29. (3) Have him check his answer to Self-Evaluation 3-2c. Discuss it with him if necessary.

IV

Selects the mode from measurements.

The student applies the concept that the mode is the measurement that occurs most often in the data set.

Student Action: Reporting the mode correctly.

A: 6 hours
B: 4 hours
C: 15 hours

O2 Core 7

Performance Check A: Barbara asked her classmates to keep track of the number of hours of television they watched in a week. Her data are shown below.

STUDENT	TIME (in hours)	STUDENT	TIME (in hours)
Nick	2	Jean	1
Wendy	7	Doug	6
Joyce	5	Sheila	4
Bob	0	Mike	23
Henry	6	Bruce	11
Janice	8	Cathy	3

What is the mode of this set of measurements?

Remediation: See the Remediation for IV-02-Core-6.

Constructs a histogram.

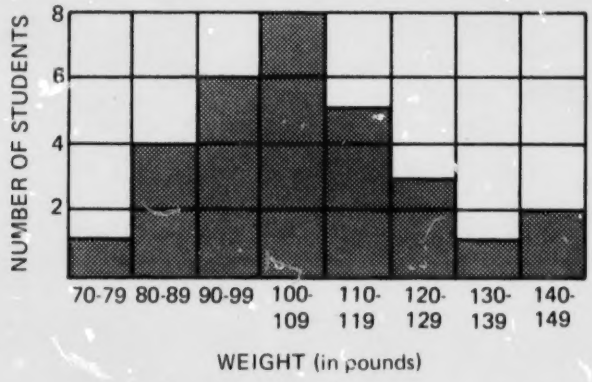
IV O2 Core 8

The student applies the procedure for constructing a histogram.

Special Preparations: Prepare a grid for the student or duplicate the appropriate grid from the end of this book.

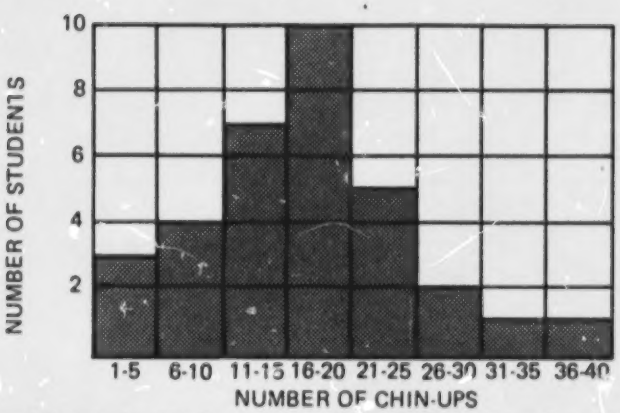
Student Action: Constructing the appropriate histogram, following the procedure which includes (1) labeling and numbering the horizontal axis so that each data group is the same width, (2) labeling and numbering the vertical axis so that each scale division represents the same number of individuals, and (3) constructing in each of the columns a vertical bar representing a data group whose height, as measured by the vertical scale, corresponds to the number of individuals in that data group.

A:



B:

C:



Performance Check A: Hank measured the weight of each student in his class. His table of data is shown below.

WEIGHT (in pounds)	NUMBER OF STUDENTS
70 - 79	1
80 - 89	4
90 - 99	6
100 - 109	9
110 - 119	5
120 - 129	3
130 - 139	1
140 - 149	2

Get a piece of graph paper from your teacher. On it, construct a histogram of Hank's data.

Remediation: (1) Refer the student to Figure 3-1 on page 26 and to the first and second paragraphs on page 27. (2) Check with him his answers to Self-Evaluations 3-1 and 3-2.

States why data are arranged in histograms or other graphs.

IV O2 Core 9

The student recalls the reason that data are often arranged in histograms or other kinds of graphs.

Student Action: Responding to the effect that graphs or histograms make patterns in the data easier to see.

Performance Check A: Why are data often arranged in histograms or in other kinds of graphs?

Remediation: (1) Refer the student to the first paragraph on page 31. (2) Refer him to the last paragraph on page 31. (3) Have him explain how graphs fit the saying "One picture is worth a thousand words," which is quoted on page 71, Excursion 3-1.

Groups data in fifths.

IV O2 Core 10

The student applies the procedure for grouping data in fifths in a blank sample table.

Student Action: Completing a data table by (1) dividing the range of the data by five and raising the quotient to the next whole number to determine the number of units (N) in a fifth, (2) finding the lower limit of the bottom fifth (group) by lowering the lowest measurement to the preceding whole number, (3) finding the lower limits of each of the fifths by successively adding N to the lower limit of the bottom fifth, (4) finding the upper limit of each of the fifths by adding N - 1 to the lower limits of each of the fifths, (5) writing the upper and lower limits of each fifth in the appropriate column of the table, and (6) counting the total number of measurements that fall into each fifth, and recording them in the table.

A, B, and **C.**

FIFTH	LIMITS OF RANGE FOR THAT FIFTH	NUMBER OF INDIVIDUALS
1	54 - 57	3
2	58 - 61	14
3	62 - 65	8
4	66 - 69	2
5	70 - 73	3

Performance Check A: Henry measured the height of all the students in his class. His measurements in inches are shown below.

59 73 58 61 71 58 59 63 70 60 62 60 58 65 62
64 61 63 54 67 55 61 64 62 68 57 60 59 58 61

Construct a table like the one below, and group Henry's data in fifths.

FIFTH	LIMITS OF RANGE FOR THAT FIFTH	NUMBER OF INDIVIDUALS
1		
2		
3		
4		
5		

Remediation: (1) Refer the student to Table 3-3 on page 31. (2) Check the student's answers to questions 3-13 through 3-17 on page 32. (3) Check his answer to Self-Evaluation 3-2.

IV O2 Core 11

Explains why experiments are often repeated many times.

The student recalls the reason that experiments are often repeated many times.

Student Action: Stating in his answer the notion either that it is easier to see a pattern in the data when there are more data or that experiments are often repeated to check the results for accuracy.

Performance Check A: Scientists will often do an experiment, collect some data, and draw a conclusion from their data. Then they will repeat the experiment, collecting even more data. Why are experiments often repeated many times?

Remediation: (1) Refer the student to the last paragraph on page 32. (2) Have him review Self-Evaluation 4-1. Then ask him if the same thing could be true of one experiment that is true of one trial or measurement.

IV O2 Core

States a reason for repeating measurements and averaging them.

The student recalls the reason for making multiple measurements and averaging them when doing an activity.

Student Action: Responding, in effect, that the effect of errors unique to individual measurement are reduced by repeating measurements and averaging them.

Performance Check A: You made three measurements of each student's peripheral vision and averaged the measurements. Why did you make three measurements and average them instead of making only one measurement?

Remediation: (1) Check the student's answer to Self-Evaluation 4-1. (2) Have him read the last paragraph on page 32. (3) If a Level I text is available, have the student review the paragraphs at the bottom of page 357.

12 IV O2 Core 13

Calculates the mean and compares a value to it.

The student applies the procedure for comparing a value to the mean, which includes calculating the mean for the data, comparing the value with the mean, and subtracting the mean from the specified value to determine the difference.

Student Action: Stating whether the specified value is above or below the mean and how far above or below the mean it is.

A: 1. above (mean 6.6), 2. 1.4
B: 1. above (mean 11.1), 2. 3.9
C: 1. below (mean 11.6), 2. 2.6

Performance Check A: The students of Bell Junior High School were selling pizzas to raise money for the school band. Cindy was in charge of keeping the records for her team. The number of pizzas each student sold is shown below.

STUDENT	NUMBER OF PIZZAS SOLD
Harold	8
Jim	4
Bert	9
Karen	6
Lloyd	23
Hank	2
Norma	0
Dennis	1
Ted	5
Rick	8

1. Is the number of pizzas Harold sold above or below the mean for the whole class?
2. How far above or below the mean is it?

Remediation: (1) Review the student's answers to questions 4-4 through 4-7 on page 36. (2) If necessary, refer the student to page 28 to review how to calculate the mean. (3) If you conclude that his error was simply an arithmetic error, have him either correct his mistake or do an alternate check.

States why the mean may not appear in the values of the sample.

IV

The student applies the concept of the mean value of a set of numbers.

O2 Core 14

Student Action: Stating, in effect, that the mean is a calculated value based on a set of measurements and may not correspond to any measured value.

Performance Check A: Janice had a pair of white mice that occasionally produced offspring. She kept track of the number of baby mice in each litter. Her data are shown below.

LITTER NUMBER	NUMBER OF BABY MICE
1	4
2	3
3	6
4	8
5	3
6	6
Total	30
Mean	5

How is it possible for the mean litter size to be 5 although there was no litter with 5 mice in it?

Remediation: (1) Refer the student to page 28 to review the concept that the mean is a calculated value. (2) Refer him to the last paragraph on page 36. (3) Remind him that the average family is said to have 2.5 children and ask him how many families he knows that have half a child.

IV O2 Core 15

Explains what is meant by an average (normal) person.

The student applies the concept that a particular person's traits are usually not average.

Student Action: Stating, in effect, that the traits of a particular person tend to be around the mean of the population but not exactly the mean.

Performance Check A: Your text states that "perhaps the best example of an average [normal] person is someone whose characteristics are *not* average." Explain what is meant by this statement.

Remediation: (1) Refer the student to the last paragraph on page 36. (2) Note that the characteristics referred to in the check are continuous quantitative variables (example: weight), not qualitative variables (example: eye color).

States the information needed to draw conclusions from a single measurement.

IV O2 Core 16

The student applies the concept of the need for more than a single measurement or piece of data in order to draw conclusions.

Student Action: Answering negatively and, in effect, that at least the mean or range of possible values must be know.

Performance Check A: Dr. Jansen measured a certain worm. He found that it was 5 cm long.

1. Based only on the data above, is it possible to determine if the worm is large, medium, or small?
2. Explain the reason for your answer.

Remediation: (1) Ask the student if he can answer question 4-10 on page 40 before he has answered question 4-9 and why. (2) Ask the student to answer the following question and then discuss it with him:

The mean length of a certain type of whale is 16 meters. The smallest adult ever caught was 10 meters long, and the largest was 21 meters long. Is an 18-meter whale of that type a small, medium, or large one? How do you know?

Judges the necessity of closed eyes during hearing- and touch-sensitivity tests.

IV O2 Core 17

The student applies the concept that the sensitivity of a particular sense can be tested only in a situation where it is impossible for the person to use his other senses.

Student Action: Responding affirmatively and with the essence of the concept that people often use two or more senses to detect a stimulus and then cannot tell which sense detected the stimulus.

Performance Check A: Van tested several students for touch sensitivity. He also tested their ability to locate objects by hearing. During these tests, the students were told to keep their eyes closed.

1. Was it necessary for them to keep their eyes closed during the tests?
2. Explain your answer.

Remediation: Review the student's answer to Self-Evaluation 4-2.

Calculates the mean error.

IV O2 Core

The student applies the procedure for calculating the mean error.

Student Action: Subtracting the true value from the estimates to find the errors, adding the absolute values of these errors, dividing this sum by the number of estimates, and reporting the mean error correctly within ±1%.

A: 14.6
B: 12.2
C: 14.6

18

Performance Check A: Tim put 85 beans into a glass jar. He asked ten different people to estimate how many beans were in the jar. Their estimates are shown below.

NAME	ESTIMATE
Gary	105
Helen	75
Karen	93
Brian	58
Ruth	69
Ralph	95
Carol	80
Gerry	73
Pat	120
Richard	88

What is the mean error of these estimates? Show your calculations.

Remediation: (1) Check the student's answer to question 4-23, page 49. (2) Refer him to the following sample problem.

Sample Problem:

The following problem and its solution show how to calculate the mean error from data. This problem should help you to understand better the concept of mean error.

The values in the left-hand column represent estimates of a quantity. Your main concern is (1) to know how close each one of the estimates is to the actual (absolute) value and (2) to determine how accurate these estimates are. The mean is 10.

ESTIMATES OF A QUANTITY	DIFFERENCE FROM THE MEAN	ABSOLUTE VALUE OF THE DIFFERENCE
10	0	0
12	+2	2
8	-2	2
4	-6	6
16	+6	6
6	-4	4
14	+4	4
		24

There is a total of seven measurements. If you add up the absolute values of the difference and divide by the number of estimates or measurements, you get

$$\text{Mean error} = \frac{24}{7} = 3.4$$

The steps to calculate the mean error are

a. subtracting the true value from the estimates to find the error,
b. adding the absolute values of these errors, and
c. finding the mean error by dividing the sum in line b by the number of estimates.

States the usefulness of a mean error calculation.

IV O2 Core 19

The student generates an explanation for the usefulness of making a mean error calculation when carrying out an investigation.

Student Action: Stating, in effect, that the mean error provides a good measure of the extent of the variation within the data.

Performance Check A: You had several people estimate when one minute had passed. You then calculated the mean error of their estimates. Why is the mean error of measurements calculated?

Remediation: (1) Review the student's answer to question 4-23 on page 49. (2) Have him work the following sample problem. Then explain the usefulness of calculating the mean error for data.

Sample Problem:

The values in the table below are estimates of a quantity. You are to find out how accurate these estimates are. The mean is 10.

ESTIMATED QUANTITY	DIFFERENCE FROM MEAN	ABSOLUTE VALUE OF DIFFERENCE
10	0	0
12	+2	2
8	-2	2
4	-6	6
16	+6	6
6	-4	4
14	+4	4
		Total 24

There is a total of 7 measurements. If you add up the absolute values of the differences and divide by the number of estimates or measurements, you get

$$\text{Mean error} = \frac{24}{7} = 3.4$$

Would the range of the values in the "Estimated Quantity" column be smaller or greater if the mean error were 1.2 rather than 3.4? Discuss your answer with your teacher.

IV O2 Core 20

Calculates the mode error.

The student generates the procedure for finding the mode error.

Student Action: Subtracting the actual value from the estimates to find the errors and reporting the mode error as the absolute error which occurs most frequently.

A: 3
B: 1
C: 6

Performance Check A: Harry tested several students to see how accurately they could estimate when 15 seconds had passed. His data are shown below.

STUDENT	ESTIMATED TIME (in seconds)
Jim	12
Susan	14
Nancy	9
Frank	21
Carol	13
John	18
Sally	17
Mary	12
Wes	16
George	15

What is the mode error for the time sense of these students? Show your calculations.

Remediation: (1) Check the student's answers to questions 3-10 and 3-11 on page 29 (calculating mode). (2) Check the student's answer to question 4-24 on page 49. (3) If the student cannot solve the problem because he does not know how to calculate mode error, refer him to the sample problem below.

Sample Problem:

The following values are estimates of a quantity. The actual value of the quantity is 12. In calculating the mode error, you are interested in the differences between every estimate and the actual value of the quantity 12. From the column of absolute values of these quantities, you select the value which occurs most frequently and identify it as the mode error.

ESTIMATED QUANTITY	DIFFERENCE FROM 12	ABSOLUTE VALUE OF DIFFERENCE
13	+1	1
18	+6	6
10	-2	2
14	+2	2
17	+5	5
15	+3	3
10	-2	2

Notice that the absolute value is the difference from 12 with the sign removed. The number 2 occurs more often as the absolute value of the difference (3 times) than any other number. Therefore, 2 is the mode error.

States why researchers are concerned with similarities.

The student recalls that many research problems concern groups of people.

Student Action: Responding to the effect that many researchers are concerned about similarities and patterns because the best way to judge what will be best for the greatest number of people is to determine the characteristics of the group.

Performance Check A: In much research about people, the researchers measure patterns and similarities within groups. Why are many researchers more concerned about similarities than about individual differences?

Remediation: (1) Have the student read pages 51 and 55. (2) Review his solution to any one of the problem breaks in Chapter 5.

IV O2 Core 21

States whether the characteristics of an individual are obtainable from group data.

The student applies the concept that the mean can only be used when describing the characteristics of the entire group.

IV O2

Core 22

Student Action: Responding negatively and to the effect that it is impossible to predict the characteristics of a particular individual from the mean for the group because the mean is a group characteristic and is not specific to any group member.

Performance Check A: Gilbert calculated the mean age of all the students in his class to be 14 years 4 months. Rosalee is one of the students in his class.

1. Using only the above information, can you determine Rosalee's age to the nearest month?
2. Explain your answer.

Remediation: (1) Check the student's answer to Self-Evaluation 4-4. (2) Refer him to the first paragraph on page 56, and discuss the concept that information about the individual is lost in the group data. (3) For the definition of the *mean* of a sample, refer the student to the section following question 3-7 on page 28.

IV O2 Exc 3-1 1

Selects and names the proper points used to convert a histogram to a line graph.

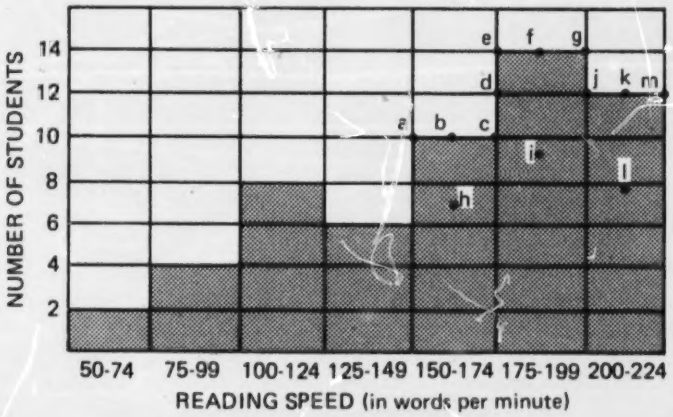
The student applies the concept involved in selecting the points in a histogram to use when converting it into a line graph.

Student Action: Selecting the letters in the center of each bar top and naming them as midpoints.

A: 1. b, f, k; 2. midpoint
B: 1. a, f, i; 2. midpoint
C: 1. c, g, j; 2. midpoint

Performance Check A: Mrs. Hill tested her students' reading speed. She plotted a histogram of the data collected.

1. List the letters of the points in the histogram that she should use to change the histogram to a line graph.
2. What are these points called?



Remediation: (1) Check the student's answer to question 2 on page 73. (2) Discuss Figure 3 on page 72 with him if necessary.

IV O2 EXC 4-1 1

Measures angles.

The student manipulates a protractor to measure angles by placing the protractor so that its reference point is at the vertex of the angle, the side of the baseline with the 0° marking lies along one arm of the angle, and the other arm of the angle cuts the arc of the protractor at the point to be read.

Regular Supplies: 1 protractor

Student Action: Reporting the size of each angle correctly to within ±2°.

A: 1. 49 ±2°, 2. 122 ±2°
B: 1. 33 ±2°, 2. 140 ±2°
C: 1. 60 ±2°, 2. 105±2°

Performance Check A: Use a protractor to measure the size of the two angles below. Record your answers on a separate paper.

Remediation: (1) Review the student's answers in Table 1, page 79. (2) Review his answer to question 3, page 77. (3) If your student has problems using a protractor, you may find the teacher's notes on pages 76 through 78 helpful.

IV O2 EXC 4-1

Constructs angles with a protractor.

The student manipulates a protractor to construct angles of less than 180° by (1) drawing a straight line, (2) placing the protractor so that its straight edge lies along the line and its reference point is at some marked point on the line, (3) marking the angle to be constructed with a dot along the arc of the protractor, and (4) drawing a line joining the marked point and the dot.

Regular Supplies: 1 protractor

Student Action: Constructing each angle correctly to within ±2°.

Performance Check A: Use your protractor to construct angles of 25° and 108° on your answer sheet, and label each of them.

2

Remediation: (1) Check the student's answers to questions 5 and 6 on pages 79 and 80. (2) If the angles the student drew for questions 5 and 6 are poor, refer him to Activity 3 in Excursion 4-2, page 79, and work through the procedures for one of the two angles in the performance check he did. (3) Have him construct the other angle in the check by himself. If he needs further help, assign him an alternate performance check.

IV
O2
Exc
4-2
1

States the advantages of different eye locations for different animals.

The student applies the concepts that an animal with eyes in the front of its head has better depth perception than one with eyes in the sides of its head and that an animal with eyes in the sides of its head has a wider range of vision than one with eyes in the front of its head.

Student Action: Stating, in effect, that it would be advantageous for the animal that hunts other animals to have eyes in the front of its head because it would then have greater ability to judge distances when attacking its prey and that it would be advantageous for the animal that eats grass to have eyes in the sides of its head because it would then have a wider range of vision to spot approaching enemies.

A: 1. Sides, 3. Front
B: 1. Sides, 3. Front
C: 1. Front, 3. Sides

Performance Check A: Animals with different characteristics often live in different areas, eat different food and have different enemies. The chart below shows some of the differences between two kinds of animals.

CHARACTERISTICS	ANIMAL A	ANIMAL B
Type of animal	large, hooved animal	large bird
Living area	open, flat plains	nests on mountain ledges
Main food	grasses	small animals
Method of feeding	grazes grass	swoops down from the sky at high speed
Enemies	large members of the cat family	man

1. Would it be advantageous for animal A to have its eyes in the sides of its head or in the front of its head?
2. State the reason for your answer.
3. Would it be advantageous for animal B to have its eyes in the sides of its head or in the front of its head?
4. State the reason for your answer.

Remediation: Review the student's answer to question 3 in Excursion 4-2, page 84.

States why particular fingerprints didn't match standard sets.

IV O2 Exc 4-3 1

The student applies the concept that no two people have exactly the same fingerprints.

Student Action: Stating, in effect, that the sample fingerprints are representative of various typical patterns and no one's fingerprints will look exactly like any one of them.

Performance Check A: When you classified your fingerprints, using the standard prints shown below, you probably noticed that your fingerprints were not exactly the same as any of the standard prints. Why didn't your fingerprints match any of the sample prints?

Plain arch

Tented arch

Loop

Plain whorl

Remediation: Refer the student to the first paragraph in Excursion 4-3 on page 85.

Explains why sampling techniques are used to measure group characteristics.

IV

The student generates an explanation for using sampling techniques when measuring group characteristics.

O2 Exc 5-1 1

Student Action: Responding with the notion that sampling is used because measuring the characteristics of the entire population is usually too time consuming and expensive.

Performance Check A: Researchers usually measure the characteristics of a population by making measurements on only a sample of the population. Why do they use a sample rather than measure the entire population?

Remediation: (1) Have the student read the first, second, and third paragraphs in Excursion 5-1, page 89. (2) Check his answer to Self-Evaluation 5-1.

IV O2 Exc 5-1 2

Selects a graph of a normal curve.

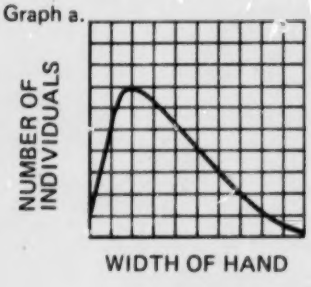
The student identifies the smooth, bell-shaped, symmetrical curve as a normal curve.

Student Action: Selecting the graph of the normal curve.

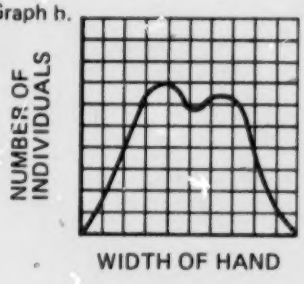
A: d
B: b
C: c

Performance Check A: Which one of the curves below is a normal curve?

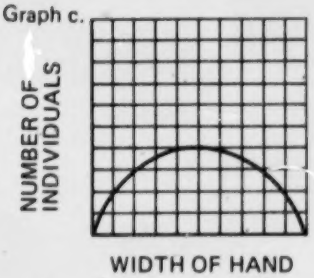
Graph a.



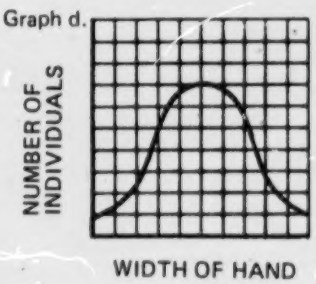
Graph b.



Graph c.



Graph d.



Remediation: (1) Refer the student to Figures 1, 2, and 3 on pages 90 and 91. (2) Have him read the paragraphs following Figure 1, page 90.

Selects the typical curve for continuously varying human traits.

IV O2 Exc 5-1 3

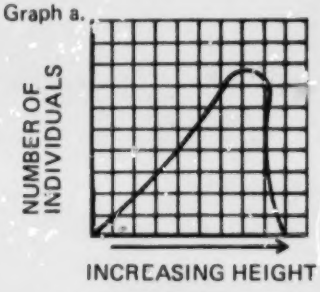
The student applies the concepts that the ideal random sample has the same distribution of characteristics as the total population and that most continuously varying human traits in the total population produce a normal curve when graphed.

Student Action: Selecting the graph of a normal curve.

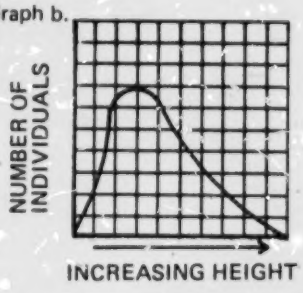
A: c
B: b
C: d

Performance Check A: Suppose you were going to measure a continuous human variable such as height. You would select a random sample of people, measure their heights, and draw a graph of the results. Which of the graphs below would you expect your graph to look like?

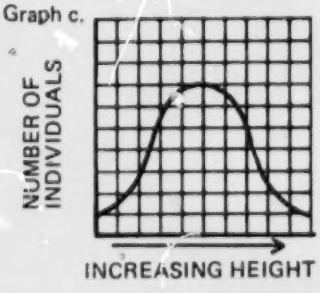
Graph a.



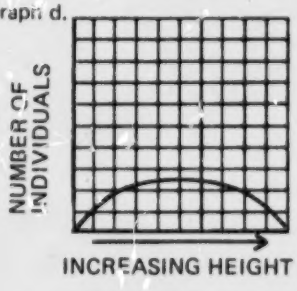
Graph b.



Graph c.



Graph d.



Remediation: (1) Have the student read the section entitled "Random Sampling" on page 92. (2) Refer him to Figure 1 and the paragraphs following on page 90.

Defines *random sample.*

IV O2

The student recalls the definition of *random sample.*

Student Action: Stating, in effect, that a random sample is a sample which is chosen in such a way that each member of the population has the same chance to be included in the sample.

Performance Check A: What is meant by *random sample*?

Remediation: (1) Have the student read the first three paragraphs of the section entitled "Random Sampling" on page 92. (2) Check his answer to question 4 on page 92 and his answer to Self-Evaluation 5-1.

EXC 5-1 4

IV O2 EXC 5-1 5

States why a random sample is desirable.

The student recalls the reason that researchers want random samples.

Student Action: Responding with the notion that a random sample is desirable because the characteristics of the sample represent the characteristics of the entire population, not just a small, unusual group.

Performance Check A: Researchers often spend a great deal of time and money getting a random sample. What is the purpose of a random sample?

Remediation: (1) Refer the student to the section entitled "Random Sampling" on page 92. (2) Review his answer to Self-Evaluation 5-1.

IV O2 EXC 5-1 6

Recognizes whether a sample is random or not

The student applies the concept of random sampling to an experimental situation.

Student Action: Responding negatively and with the essence of the concept that a sample is random only if each member of the population has an equal chance of being selected.

Performance Check A: Sally wanted to determine how many library books the average student in her school read each month. She couldn't ask everyone in the school, so she decided to select a sample. She stood in the library and asked the first 25 students who walked in how many books they had read during the last month.

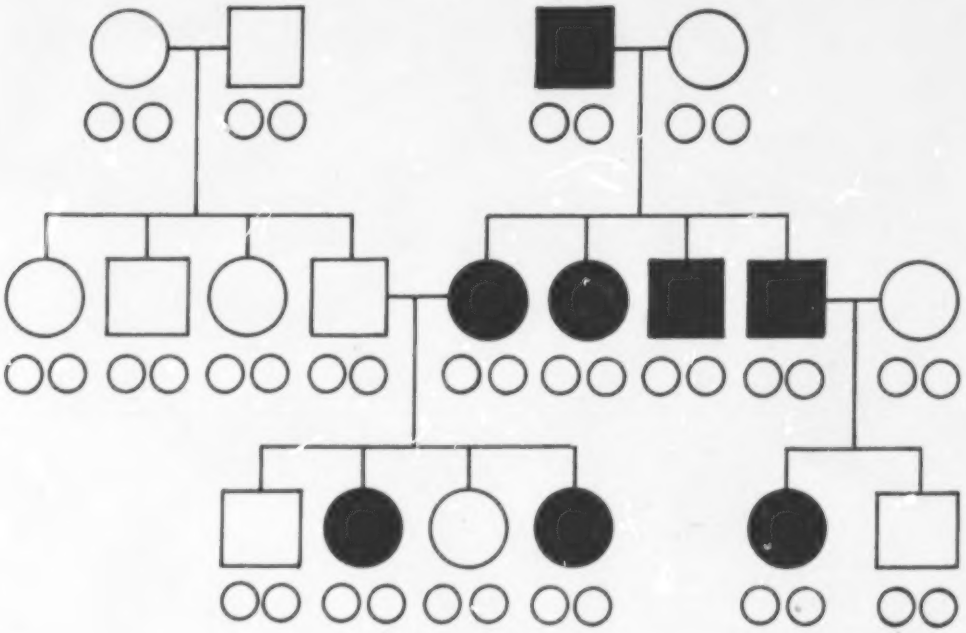
1. Was her sample a random sample?
2. Explain your answer.

Remediation: (1) Have the student read the section entitled "Random Sampling," pages 92 and 93. (2) Check his answer to question 5 on page 92. (3) Have him consider the example of the random sample described in Self-Evaluation 5-1. (4) Have him do an alternate check.

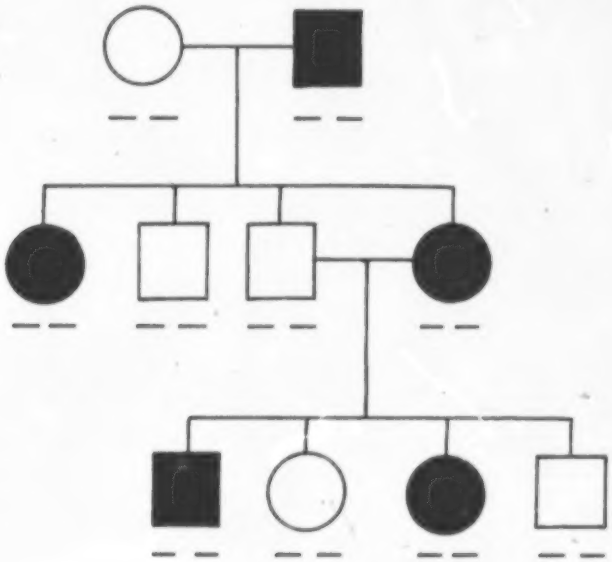
Charts and Grids

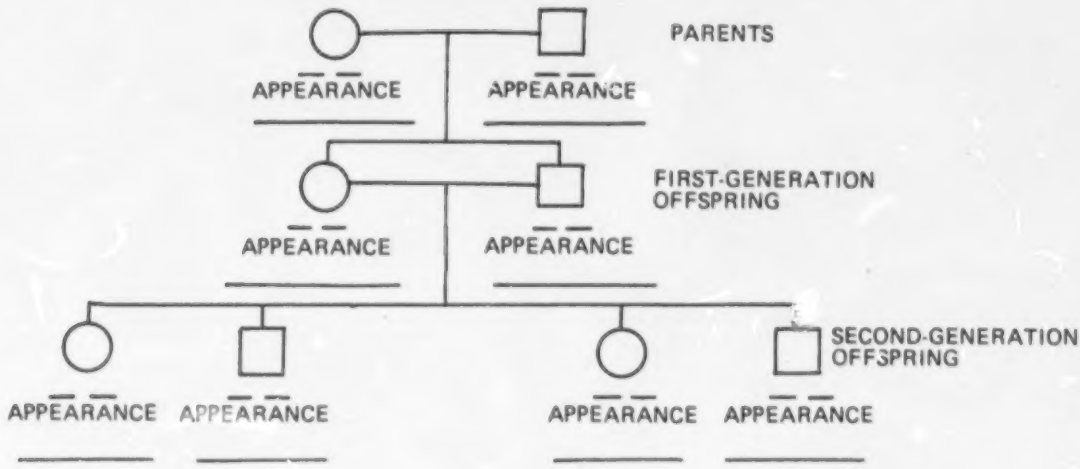
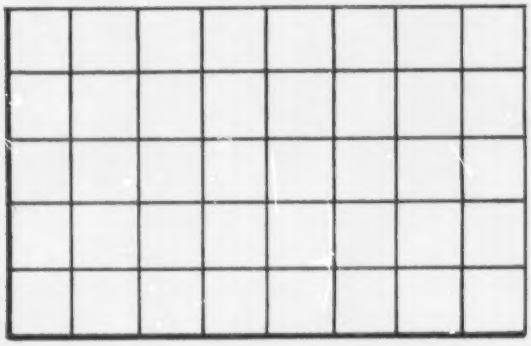
WYY IV

WYY
02-Core-22A, B, C



WYY
03-Exc 7-2-1A, B, C



Copy from the check any of the information which is not on the chart below. Then complete the rest of the chart as directed in the check.

WYY
03-Exc 7-4-1A, B, C